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Note.—Initialed reviews are written by:—

Dr. J. Wishart .. .. J. W.

* General studies, see also individual crops.

15 APR 1955
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Plant Breeding Abstracts

Vol. XXV, No. 2

*STATISTICS

633 GOMES, F. P.
A decadência do teste t. (**The decline of the t test**).
Rev. Agric., S. Paulo 1954 : **29** : 215–18.
A review of recent work on the development and generalization of tests for comparing means is presented.

634 MÜLLER, K-H.
Eine graphische Methode der varianzanalytischen Versuchsauswertung. (**A graphical method of evaluating experimental results by means of the analysis of variance**).
Z. Pflanzenz. 1954 : **33** : 427–36.
A method whereby the arithmetic operations on squared quantities involved in the analysis of variance can be performed graphically by making use of Pythagoras's theorem is described.

635 IHM, P.
Ein Konfidenzbereich für den Erwartungswert eines Mittelwertepaares. (**A confidence range for the expected value of a pair of means**).
Z. indukt. Abstamm.- u. VererbLehre 1954 : **86** : 54–60.
A graphical method whereby the confidence range of the mean values of a pair of normally distributed biometrical characteristics can be represented by the construction of an appropriate ellipse is described.

636 IHM, P.
Anwendung von Hotellings verallgemeinertem *T*-Test zur Prüfung der Differenz zweier Mittelwertepaare. (**The application of Hotelling's generalized *T* test to the testing of the difference between two pairs of mean values**).
Z. indukt. Abstamm.- u. VererbLehre 1954 : **86** : 143–56.
Methods of determining the significance of differences between the mean values of two sets of biometrical characteristics considered in conjunction, based on Hotelling's extension of the *t* test, are discussed. The relevance, in this connexion, of the method of representing confidence range devised by the author in an earlier paper is pointed out (cf. Abst. 635).

637 ZIMMERMANN, K.
Feldversuchswesen, Probleme und Versuche. (**Field trial methods: problems and experiments**).
Züchter 1954 : **24** : 116–27.
A critical review of current methods of conducting field trials is presented, with special reference to the large areas required. As an alternative the author outlines a method whereby analysis of variance can be applied to measurements of the yield components of individual plants. At least 100 plants of each variety should be measured and the plants must be grown at distances apart such that individual harvesting is possible. Examples of individual plant trials of cereal and root crop varieties are given.

638 ATANASIU, N.
9. Mitteilung zur Frage der Anlage und Auswertung der Feldversuche. (**Communication 9 on the question of the layout and evaluation of field experiments**).
Z. Pflanzenz. 1954 : **33** : 151–56.
The application of analysis of variance to the determination of the way in which varietal and soil characteristics contribute to crop yield is criticized on the basis of an analysis of a uniformity trial with hemp laid out at Paulinenaue and of an experimental model devised by Mudra.

639 MUDRA, A.
Ein Vergleich verschiedener Versuchsmethoden. (**A comparison of different experimental methods**).
Z. Pflanzenz. 1954 : **33** : 419–23.
The relative efficiencies of the following designs were ascertained from an analysis of a winter wheat uniformity trial: completely randomized layout, randomized blocks, Latin square, split-plots, Lindhard's layout, balanced incomplete blocks and a lattice design. The efficiencies of most of the designs varied according to the experimental conditions; the most consistently satisfactory design was the randomized block layout.

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* General studies, see also individual crops.

*GENETICS

The Nuzhdin-Huxley controversy.
Pakist. J. Sci. 1954 : **6** : 83–93.

Addresses by the speakers mentioned below and a report of a subsequent discussion between them on the occasion of the Pakistan Science Conference held in January 1954 are given.

640 *Huxley, J. Evolution and modern thought.* (*p.* 84).

The evolutionary potentialities of the human mind are indicated and criticism is made of the subordination of science to ideology in the USSR.

641 *Nuzhdin, N.* [*Nuždin, N. I.*]. *The Michurin teachings—the foundation of Soviet biology.* (*pp.* 84–90).

The theory of the comparatively immutable gene is criticized as leading to pessimistic conclusions regarding the possibilities of plant and animal improvement and to undesirable eugenic recommendations. Recent work on directed mutation is believed to undermine the classical notion of the gene.

In support of Soviet genetical theory, the speaker describes Lysenko's work on the interconversion of spring and winter wheats, Mičurin's work on mentors, and experiments by himself on interspecific grafts in *Crepis* leading to a reduction in the frequency of satellited chromosomes.

642 McLaren, A. & Michie, D.
Current trends of genetical research in Hungary.
Nature, Lond. 1954 : **174** : 390–91.

On the basis of their recent visit to Hungary, the authors give a brief survey of some investigations on plant and animal genetics in progress at several institutes. They outline work by Györffy on vegetative rapprochement and vegetative hybridization in *Nicotiana* and by Felföldy on vegetative hybridization of the tomato. They report that a laboratory for research on the genetics of microorganisms has recently been set up at the Institute of Agrobiology of the Hungarian Academy of Sciences, Budapest. Pontecorvo's work on heterocaryosis has stimulated the study of *Penicillium*, a method of prolonging the haploid phase of yeasts is being used in investigating directed mutagenesis and study of the transfer of heritable properties by killed cells in *Rhizobium* is under way. The last-mentioned project is partly designed to throw light on vegetative hybridization, since it is thought that the heritable effects of the stock upon grafted plants may be analogous to transduction or transformation in bacteria.

643 Iltis, A.
Gregor Mendel's autobiography.
J. Hered. 1954 : **45** : 231–34.

An English translation is given of Mendel's account of his studies and personal circumstances, submitted at the time of his application for permission to take the examination for entering Vienna University as an extraordinary student. The translation is accompanied by facsimile reproductions of two of the pages.

644 Lewis, D.
Genetics and the advancement of science.
Nature, Lond. 1954 : **174** : 672–73.

An account of the session held on genetical topics at the recent British Association meeting at Oxford is presented. J. Heslop-Harrison discussed the impact of genetics upon taxonomy. K. Mather gave an historical account of the controversies between the Galton-Pearson group of biometricians and the Bateson school of Mendelians. S. C. Harland analysed the reasons why the early improvers of plants were able to achieve success without any genetical knowledge. D. Lewis considered the physiological effects of genes and the role of the cytoplasm in differentiation. In a joint contribution with G. Pontecorvo, J. A. Roper discussed some aspects of microbial genetics. E. B. Ford gave a report of his recent research on butterflies, A. Robertson dealt with livestock breeding and L. R. Penrose examined the problems of human genetics. The session was concluded with a summing-up by C. D. Darlington.

645 Went, F. W.
Gene action in relation to growth and development. I. Phenotypic variability
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 839–48.

"The major part of the commonly encountered variability of genetically uniform material (phenotypic variability) is not due to statistical fluctuations of the numbers of molecules on which development depends, but is largely caused by inconstancy of and irregularities in the external environment. The genetic homogeneity of pure lines can be translated under completely controlled conditions into phenotypic uniformity of plant material which exceeds

* General studies, see also individual crops.

anything observed thus far. The more optimal the growing conditions are, the smaller is phenotypic variability. When the standard deviation is expressed as per cent of the mean, variability in peas and tomatoes is regularly reduced to 2% and in the most favourable material it was as little as 1·2%. Due to an autoregulatory mechanism phenotypic variability decreases in the course of development. All these facts lead to the conclusion that the laws of organic development fall outside the laws of statistical or quantum mechanics."

[Author's summary.]

646 ANDERSON, V. L.
A model for the study of quantitative inheritance.
Iowa St. Coll. J. Sci. 1954 : **28** : 276–77. (Abst.)

A simple model which can be used for studying gene interactions is described. It is an analogue of the factorial model used for experimental designs. By employing the model on unpublished data on quantitative inheritance obtained by I. Khambanonda and by G. H. Stringfield, the author was able to show that epistatic interaction may contribute considerably to genotypic values. It is also shown that the scaling tests described by K. Mather (cf. **PBA*, Vol. XIX, p. 913) do not necessarily demonstrate absence of epistasis.

647 MURTY, V. N.
Estimation of linkage by the method of minimum discrepancy.
Genetics 1954 : **39** : 581–86.

Tables are given for estimating linkage from F_2 data for various phenotypic ratios by applying J. B. S. Haldane's method of minimum discrepancy for the estimation of single parameters from a given sample.

648 MURTY, V. N.
The calculation of linkage values by Fisher's scoring method.
Indian J. Genet. 1954 : **14** : 39–43.

A table of formulae of expected phenotypic frequencies, scores and amount of information per individual is given with the object of simplifying Fisher's system of calculating linkage values by scoring (cf. *PBA*, Vol. XVII, Abst. 567).

649 SCHWARTZ, D.
Studies on the mechanism of crossing over.
Genetics 1954 : **39** : 692–700.

Describing the results of his analysis of somatic sister-strand crossing-over in *Drosophila*, the author examines in greater detail the hypothesis that crossing-over is not an event occurring subsequently to duplication of the chromosome into chromatids but is instead the result of an exchange between new chromatids during the process of their formation on a template of the parent chromosome (cf. *PBA*, Vol. XXIV, 286 and 1553).

650 WHITEHOUSE, H. L. K.
Analysis of unordered tetrads segregating for a lethal or other epistatic factor.
Nature, Lond. 1954 : **174** : 463–64.

In the general case of segregation involving three pairs of unlinked loci *A*, *B* and *C*, five classes of tetrads can be recognized. When *A* is lethal or suppresses the phenotypic difference between one or both of the other pairs of factors, tetrad classes IV and V are mutually indistinguishable. Formulae are provided for estimating segregation frequencies in this case.

651 DOBZHANSKY, T. & SPASSKY, N.
Environmental modification of heterosis in *Drosophila pseudoobscura*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 407–15.

At 25°C., heterozygotes of *D. pseudoobscura* with the ST/CH gene arrangements are superior to the homozygotes. If the temperature is slightly reduced, heterosis disappears when the flies are fed on food containing *Zygosaccharomyces dobzhanskii*, but not apparently when the diet contains *Kloeckera apiculata* or *Saccharomyces cerevisiae*.

652 RIETSEMA, J., SATINA, S. & BLAKESLEE, A. F.
On the nature of the embryo inhibitor in ovular tumors of *Datura*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 424–31.

The substance, produced in ovular tumours of *D. inoxia* x *D. discolor*, which inhibits embryonic growth in *D. stramonium* has been identified by paper chromatography as indole-3-acetic acid. The pure chemical has a similar effect.

653 MARSHAK, A. & MARSHAK, C.
Biological role of deoxyribonucleic acid.
Nature, Lond. 1954 : **174** : 919–20.

Analysis of the pronuclei of various echinoderm eggs has shown that these do not contain deoxyribonucleic acid. It would thus appear

that the genetic template theory of the role of deoxyribonucleic acid is incorrect. The authors suggest that ribonucleic acid protein is the basis of genetic specificity and that the role of deoxyribonucleic acid is one of regulation.

654 GLASS, B.
Genetic recombination.
Science 1954 : **120** : 290–91.

An account is given of the seventh annual symposium of the Biology Division of the Oak Ridge National Laboratory, held during April 1954 on genetic recombination, in collaboration with the US Atomic Energy Commission. The contributions dealt with various aspects of the subject in the light of recent research on bacterial transformation and transduction, genetic recombination in bacteriophage and bacteria, chromosome replication and behaviour, the structure of the deoxyribose nucleic acid molecule, and recombination in natural populations of *Drosphila*.

655 PREER, J. R. (JUN.), SIEGEL, R. W. & STARK, P. S.
The relationship between kappa and paramecin in *Paramecium aurelia*.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1228–33.

A detailed account is given of investigations which have been referred to in *PBA*, Vol. XXIV, Abst. 1559.

656 MICHAELIS, P.
Versuche über die Ursachen der Plasmon-Umkombination. (**Experiments on the causes of plasmon recombination**).
Z. indukt. Abstamm.- u. VererbLehre 1954 : **86** : 101–12.

Experiments conducted at the Max Planck Institute for Breeding Research, Voldagsen, Germany, showed that the segregation of plasmagenes in *Epilobium* is not caused by the union of female and male cytoplasm during fertilization. Plasmon segregation in *E. hirsutum* ♀ x *E. parviflorum* ♂ hybrids varied both quantitatively and qualitatively according to the particular *E. parviflorum* genotype employed. Plasmon changes were successfully induced by changes in temperature.

657 SAGER, R.
Mendelian and non-Mendelian inheritance of streptomycin resistance in *Chlamydomonas reinhardi*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 356–63.

The genetics of two streptomycin-resistant strains (sr–1 and sr–2) of *Ch. reinhardi* was investigated. The factor for resistance in sr–1 behaves as a single Mendelian gene linked with a centromere. In the case of sr–2, the progeny of crosses to a sensitive strain were all resistant. When the F_1 progeny of + mating type were crossed to a sensitive strain, all the F_2 individuals were found to be resistant; the — F_1 individuals similarly crossed gave rise, with but rare exceptions, to sensitive offspring. The streptomycin resistance of sr–2 is believed to be extrachromosomal in origin, but the mechanism of loss of resistance in the cross with — sensitive strains remains obscure.

658 PATLAK, C. S.
The effect of the previous generation on the distribution of gene frequencies in populations.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1063–68.

Emended values of Δq (q, t), the systematic change of q at time t in the Fokker-Planck equation proposed by S. Wright to describe the distribution of gene frequencies (cf. *PBA*, Vol. XVI, Abst. 631), are worked out for the case when the systematic change for a given generation is a function of the initial environment and of the gene frequencies of the given antecedent generations.

659 MOËS, A.
Radiations et mutations. (**Radiations and mutations**).
Ann. Gembl. 1954 : **60** : 149–70.

A general account of the mutagenic effects of electromagnetic radiation and X, γ, infrared, ultraviolet, cosmic and light rays is presented, together with observations on the chemical, physical and physiological changes involved in the mutating cell.

660 SPENCER, J. L. & BLAKESLEE, A. F.
Induced pollen lethals from seeds of *Datura stramonium* exposed to radiation from a nuclear detonation.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 441–46.

Fast neutrons from a nuclear detonation appeared to be 13–14 times more effective in inducing lethal mutations in *D. stramonium* pollen than either X or γ rays.

661 GUSTAFSSON, Å.
Mutationer i växtförädlingens tjänst. (**Mutations in the service of plant breeding**).
Natur o. Kultur 659–76.

In describing the history and development of the mutation theory with special reference to its practical aspects, the author illustrates his exposition by the results of relevant research

carried out mainly in Sweden (cf. Absts. 156 and 175). The various techniques for the induction of mutation and their particular mode of action are discussed, together with the results so far obtained by their application to crop plants.

662 ZIRKLE, C.
Citation of fraudulent data.
Science 1954 : **120** : 189–90.

The writer shows that in recent years Kammerer's work on the salamander has been frequently cited by supporters of Lysenko as providing evidence for the theory of the inheritance of acquired characters. In 1926 Kammerer himself admitted the fraudulent nature of his experiments.

663 TURBIN, N. V.
(Singular methods for proving a new evolutionary theory).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1954 : **37** : 361–65. [Russian].

IVANOV, N. D.
(The way A. N. Studitskiĭ fights Neodarwinism).
Ibid. 1954 : **37** : 366–77. [Russian].

An article by Studitskiĭ (cf. *PBA*, Vol. XXIV, Abst. 50), who supports Lysenko's theory on evolution by interspecific conversion, is criticized.

664 KOZO-POLJANSKIĬ, B. M.
(The relationship between "new ideas in the science of biological species" and Darwin's theory).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1954 : No. 3 : 85–87. [Russian].

Lysenko's evolutionary dicta are shown to conflict with the Darwinian theory in 18 different points, each rival concept being brought out by juxtaposition.

665 ŠELKOVNIKOV, S. S.
(The problem of "Malthusianism" in biology).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1954 : No. 3 : 89–108. [Russian].

Darwin's concept of overpopulation is examined in the light of his own writings and those of Engels, Černyševskiĭ, Timirjazev and other authors. It is concluded that the evolutionary theory is founded upon the principle, known before Malthus, that life tends to reproduce more quickly than food resources permit. It is stated that Darwin rejected the views expounded by Malthus but erroneously referred to the above principle as a Malthusian law. Over-population and intraspecific competition are accepted as integral parts of Darwin's theory and should not be identified with Malthus. In this connexion, charges of "Malthusianism" made against Sukačev and other Darwinists by some of Lysenko's followers are rebutted.

666 SUKAČEV, V. N. & IVANOV, N. D.
(The problems of mutual relations between organisms and the theory of natural selection).
Ž. obšč. Biol. (J. gen. Biol.), Moscow 1954 : **15** : 303–18. [Russian].

An article by Rubaševskiĭ (cf. *PBA*, Vol. XXIV, Abst. 2634), setting forth Lysenko's views on interspecific competition, overpopulation and evolution by interspecific conversion, is criticized.

667 **(Editorial remarks).**
Ž. obšč. Biol. (J. gen. Biol.), Moscow 1954 : **15** : 318–19. [Russian].

Polemical tendencies in papers by Sukačev and Ivanov and by Rubaševskiĭ (cf. Abst. 666) are deprecated. Rubaševskiĭ is charged with implying that Lysenko does not regard natural selection as an evolutionary force. Sukačev and Ivanov are criticized for stating that Rubaševskiĭ's views on directed changes are teleological. Sukačev and Ivanov are also criticized for stating that Malthusian laws may be operative in capitalist societies.

668 SCHWANITZ, F. & HAHN, H.
Genetisch-entwicklungsphysiologische Untersuchungen an Galmeipflanzen. II. Über Galmeibiotypen bei *Linum catharticum* L., *Campanula rotundifolia* L., *Plantago lanceolata* L. und *Rumex acetosa* L. **(Genetical investigations of the developmental physiology of plants characteristic of soils containing zinc. II. On zinc-resistant biotypes of *L. catharticum* L., *C. rotundifolia* L., *P. lanceolata* L., and *R. acetosa* L.).**
Z. Bot. 1954 : **42** : 459–71.

Strains of the above species found in soils with a high zinc content at Blankenrode, Westphalia, proved resistant to solutions of zinc sulphate having a lethal effect on corresponding biotypes from normal soils (cf. *PBA*, Vol. XXIV, Abst. 2622). Populations resistant to concentrations of zinc were no more resistant to copper nitrate than were plants from normal soils. Zinc-tolerant biotypes had a smaller habit and smaller cells than plants taken from soils free from zinc but it is not thought that resistance to zinc is associated with plant size, since two separate selective processes are believed to be involved.

EVOLUTION

669 Good, R.
The origin of *The Origin*: a psychological approach.
Biology, Lond. 1954 : **20** : 10–16.

From a psychological study of Darwin's neurotic symptoms and what are interpreted as Darwin's guilt feelings, the author concludes that the unconscious driving force behind Darwin's evolutionary theories was a suppressed aggressive resentment against his father, due to the overbearing behaviour of the latter during Darwin's childhood.

670 **(A letter to the editor).**
Ž. obšč. Biol. (J. gen. Biol.), Moscow 1954 : **15** : p. 320. [Russian].

A letter by Lysenko, forwarded by the president of the USSR Academy of Sciences, is published. Lysenko protests against imputations by Turbin that Avotin-Pavlov's report on interspecific conversions has been shown to be a falsification (cf. *PBA*, Vol. XXIII, Abst. 1506).

671 Abalin, S. M. (Editor).
(Science and life).
Kommunist (Communist), Moskva 1954 : No. 5 : 3–13. [Russian].

The value of free discussion and criticism among scientists is affirmed. The suppression of the opposing views, as occurred in the 1948 Session of the Lenin Academy of Agricultural Sciences (cf. *PBA*, Vol. XVIII, Abst. 2000) and the attitude adopted by certain of Lysenko's supporters and by the editors of the *Žurnal Obščeĭ Biologii* and *Uspehi Sovremennoĭ Biologii* are condemned.

672 Fournier, P.
La transmutation des espèces chez les anciens. **(The transmutation of species among the ancients).**
Bull. Soc. bot. Fr. 1954 : **101** : 226–28.

By this short documented note the writer demonstrates that belief in the transmutation of species, especially of cereals, has existed from the time of Aristotle up to the present day.

673 Liszenko [Lysenko], T. D.
A növényi és állati szervezetek életrevalósága. **(The vigour of plant and animal organisms).**
Agrártudomány 1952 : **4** : 373–76.

A Hungarian version of the article summarized in *PBA*, Vol. XXIII, Abst. 847 is given.

*CYTOLOGY

Pauling, L.
Symposium on the structure and function of nucleic acids.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 747–72.

674 *Todd, A. R. Chemical structure of the nucleic acids.* (*pp.* 748–55).

A general review of recent work throwing light on the chemical structure of the nucleic acids is given, special attention being paid to the *a* and *b* nucleotides corresponding to each of the four ribonucleosides and to the question as to whether a branched-chain structure is present in ribonucleic acids.

675 *Crick, F. H. C. The complementary structure of DNA.* (*pp.* 756–58).

An account of the twin-helical theory for the structure of DNA proposed by J. D. Watson and the present author is given (cf. *PBA*, Vol. XXIV, Abst. 57).

676 *Rich, A. & Watson, J. D. Some relations between DNA and RNA.* (*pp.* 759–64).

The 1 : 1 pairing of complementary bases characteristic of DNA is found in some samples of RNA but not in others (cf. *PBA*, Vol. XXIV, Abst. 57). X-ray diffraction photographs of RNA are difficult to interpret; it seems, however, that RNA may well have a helical structure, possibly complicated by side chains in which complementary pairing of the bases does not occur. In view of the fact that protein synthesis can occur in the absence of DNA, the authors incline to the view that RNA is responsible for protein synthesis and that DNA controls the synthesis of RNA.

677 *Bolton, E. Biosynthesis of nucleic acid in* Escherichia coli. (*pp.* 764–72).

Recent work on the use of radioactive isotopes to investigate the course of events leading to the synthesis of RNA in *E. coli* is reviewed. Among the more important results of this work is the discovery that, while the purines may be synthesized from glucose carbon, the ribose associated with them is not. Moreover, when supplementary pyrimidine nucleotides are supplied, the pyrimidine is incorporated in RNA but not the phosphorus, which is taken up from the inorganic phosphorus of the basic medium.

* General studies, see also individual crops.

678 NAGARAJ, M.
DNA content in female gametophyte and nucellus of *Tradescantia paludosa*.
Curr. Sci. 1954 : **23** : p. 300.
Photometric investigations on the ♀ gametophyte and the surrounding nucellar cells in *Tradescantia paludosa* revealed a close correspondence between chromosome number and amount of deoxyribonucleic acid.

679 DELBRÜCK, M.
On the replication of desoxyribonucleic acid (DNA).
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 783–88.
The mode of replication of DNA proposed by J. D. Watson and F. H. C. Crick (cf. *PBA*, Vol. XXIV, Abst. 58) does not explain how the daughter helices can be physically separated from the parent template. The author suggests that synthesis of the daughter helices may commence at one end of the parent molecule and that, as synthesis proceeds along the length of the molecule, the parent twin-helices break at each half turn of the helix and rejoin the respective daughter strands. In this way, the original twin helix will be replaced by two twin helices, each coiled as in the original helix and each free to separate from the other.

680 CRICK, F. H. C.
The structure of the hereditary material.
Sci. Amer. 1954 : **191** : No. 4 : 54–61.
An extended popular account of the author's theory of a twin helical structure for the deoxyribose nucleic acid molecule is presented, together with a discussion of its genetical significance (cf. *PBA*, Vol. XXIV, Absts. 57 and 58).

681 LARSEN, K.
Chromosome numbers of some European flowering plants.
Bot. Tidsskr. 1954 : **50** : 163–74.
Chromosome numbers are reported for some species collected in south-western Europe. *Lotus corniculatus* var. *alpinus* ($2n = 12$) and *Digitalis parviflora* ($2n = 56$) were among the plants examined cytologically for the first time. In the case of *Lathyrus pratensis*, one race with $2n = 14$ and another with $2n = 28$ were discovered.

682 CÂMARA, A.
Posição actual do problema do centrómero. (**Present position of the problem of the centromere**).
Genet. iber. 1953 : **5** : 67–99.
The review of the literature on the subject includes a discussion of the diffuse centromere observed by the author and other investigators in *Luzula* spp., where after treatment with X-rays all fragments move to the poles. In discussing the evolutionary significance of this phenomenon the writer points out that the chromosomes in species with diffuse centromeres are all identical in size; the anaphase bridges that are seen in X-rayed material in which size differences between the chromosomes exist are pointed to as a possible mechanism whereby this size equality is ultimately established.

683 BROWN, S. W.
Mitosis and meiosis in *Luzula campestris* DC.
Univ. Calif. Publ. Bot. 1954 : **27** : 231–78.
The author concludes that possibly the chromosomal matrix is derived from the nucleolus and is directly responsible for spindle activity in *L. campestris* ($2n = 12$), a species in which the chromosomes are characterized by diffuse centric activity. The equational appearance of anaphase I in *L. purpurea* as reported by Castro and his colleagues is explained by assuming that the size relationships among the chromatids of a configuration determine the mode of disjunction, giving a mitotic type of separation irrespectively of the effects of previous crossing-over.

684 BRUHIN, A. & WANNER, H.
Über die Wirkung von Insektiziden auf die Mitose von Pflanzen. (**On the effect of insecticides on mitosis in plants**).
Phytopath. Z. 1954 : **22** : 327–42.
The insecticides 5,5-dimethyldihydro-resorcindimethylcarbamate and 1-phenyl-3-methyl-pyrazolyl-(5)-dimethylcarbamate, both urethanes, which achieve their effect after being absorbed into the cell sap by osmotic pressure, were found to impede mitosis and to cause chromosome stickiness and fragmentation, bridge formation and disturbances in anaphase in experiments on *Vicia faba* and *Crepis tectorum* at the Institute of Botany of Zürich University. The concentrations used were 0·02–0·04% in the case of the former insecticide and 0·05–0·1% in the case of the latter. Affected cells were quickly replaced by the faster-growing normal cells, but at the higher concentrations plant growth was temporarily halted. No adverse effect on the fertility of the treated plants could be ascertained; their progeny proved normal.

685 WOLFF, S. & ATWOOD, K. C.
Independent X-ray effects on chromosome breakage and reunion.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 187–92.
Investigations were carried out on some effects

of fractionated X-ray dosage upon two-hit chromosome aberrations in root-tips of *Vicia faba*, with or without the protective influence of presoaking the seeds in 2,3 dimercaptopropanol (BAL). The following results were obtained (cf. *PBA*, Vol. XXIV, Absts. 1615 and 2662): (1) the time interval between breakage and reunion was dose dependent and decreased if BAL was present during irradiation; (2) breaks produced in the presence of BAL interacted normally with those produced with absence; (3) rejoining of breaks induced in the presence of BAL was delayed by previous irradiation in its absence; (4) presoaking in BAL decreased the frequency of aberrations and the delay in reunion by different amounts; and (5) the time of delay in reunion had little or no influence upon the frequency of aberrations. The general conclusion is reached that chromosome breakage and radiation-induced delay in reunion are independent effects of radiation.

686 MIKAELSEN, K.
Protective properties of cysteine, sodium hyposulphite, and sodium cyanide against radiation induced chromosome aberrations.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 171–78.

When added to the nutrient solution in which cuttings of *Tradescantia paludosa* were kept during γ irradiation, each of the above chemicals had a protective effect upon chromosome fragmentation.

687 YOST, H. T. (JUN.), CUMMINGS, J. & BLAKESLEE, A. F.
The effects of fast-neutron radiation from a nuclear detonation on chromosome aberration in *Datura*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 447–51.

Fast neutrons from a nuclear detonation proved 14 times more effective than X or γ rays in inducing chromosome aberrations. The types of aberrations produced, however, are the same in all three cases.

688 KECK, K. & KAISER, E.
Die C-mitotische Wirksamkeit von Demecolcin im *Allium cepa*-Test. (**The c-mitotic action of Demecolcin in the *A cepa* test**).
Öst. bot. Z. 1954 : **101** : 579–85.

The alkaloid N-methyl-desazethylcolchicine (Demecolcin), known to affect cell division in cultures of animal tissues, has now been used in the *A. cepa* test to discover its cytological effect in plant cells. Treatment of onion roots for four hours with Demecolcin solutions of strengths from 0·1% to 0·0008% showed that concentrations of 0·5%, 0·1% and 0·02% caused typical c-mitotic effects.
Similar cytological effects were observed after 24 hours' treatment, c-mitoses being (*a*) specially numerous with a 0·1% solution and (*b*) accompanied by various restitution stages. The minimum concentration with a c-mitotic effect was 0·02%, as was also the case with the four hour treatment.
The subnarcotic concentration level (cf. *PBA*, Vol. XIII, Abst. 1153) is reached at 0·004%.
The discussion deals with (*a*) the inverse relationship between c-mitotic action and solubility in water; and (*b*) a possible correlation between the chemical structure of colchicine and some of its derivatives, on the one hand, and their c-mitotic action on the other. In the authors' view, among the various derivatives that were compared, Demecolcin appears to have the least thermodynamic activity and therefore the greatest c-mitotic specificity.

689 CARLSON, J. B.
Cytohistological responses of plant meristems to maleic hydrazide.
Iowa St. Coll. J. Sci. 1954 : **29** : 105–28.

In investigations on oats, maize and soya bean, treatment of the seeds with aqueous solutions of maleic hydrazide had an inhibitory effect upon mitosis. Upon resumption of mitosis, abnormal behaviour of the chromosomes was evident in the metaphase and later stages. Extensive breakage occurred, possibly as the result of stickiness. Cytokinesis was apparently normal but the daughter cells were multinucleate. The nucleolar volume increased considerably after treatment; it is suggested that this was due to an increase in the food supply of the root tips, as shown by the starch accumulation. Persistent nucleoli were found throughout the entire mitotic cycle, presumably as the result of the increase in volume.

690 KIHLMAN, B.
Effect of oxygen on the frequency of chromsome aberrations produced by 8-ethoxycaffeine.
Nature, Lond. 1954 : **174** : 561–62.

In experiments on onion root-tips, 8-ethoxycaffeine was much more effective in inducing chromosome aberrations in oxygen than in nitrogen, its action in this respect resembling that of X rays. Attention is drawn to two other points of similarity between X rays and 8-ethoxycaffeine: (1) the temperature during treatment with either agent affects the induction

of aberrations and (2) the second half of interphase is the stage most sensitive to breakage.

691 Schneiderman, H. A. & King, E. D.
Further studies on the effects of carbon dioxide and oxygen on the frequency of X-ray induced chromosome aberrations in *Tradescantia*.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 834–38.

Exposure of inflorescences of *T. paludosa* to a vacuum during X irradiation markedly decreased the frequency of dicentrics and centric rings below that encountered in the control material irradiated in air. Radiosensitivity increased as the CO_2 concentration increased in mixtures with air; in the absence of air the effect of CO_2 on radiosensitivity disappeared. Apparently CO_2 modifies the radiochemical reactions involving oxygen.

692 Swanson, C. P. & Schwartz, D.
Effect of X-rays on chromatid aberrations in air and in nitrogen.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1241–50.

In experiments on inflorescences of *Tradescantia paludosa*, X irradiation in nitrogen caused lower frequencies of chromatid aberrations than irradiation in air. The reduction in frequency of chromatid deletions was however considerably less than that found for the frequency of isochromatid deletions, although both types showed a nearly linear relation to dosage. The air/nitrogen ratios for both isochromatid deletions and chromatid exchanges fluctuated according to the stage of cell division at which irradiation was applied. These findings are in agreement with the differential reunion hypothesis of Schwartz (cf. *PBA*, Vol. XXIII, Abst. 302) rather than with the differential breakage hypothesis of Giles and his colleagues.

693 La Cour, L. F. & Rutishauser, A.
X-ray breakage experiments with endosperm. I. Sub-chromatid breakage.
Chromosoma 1954 : **6** : 696–709.

The authors give a complete account of an X-irradiation experiment on the endosperm nuclei of *Scilla sibirica* (cf. *PBA*, Vol. XXIV, Abst. 72). So-called point errors are assumed to arise through breakage and reunion of subchromatids to give structures resembling chiasmata at anaphase. Evidence was obtained of centromere interference with the point errors. Subchromatid breakage was induced only by irradiation during the period between early and late prophase. It is suggested that, during this period the chromosome is in a diffuse condition with separated half-chromatids and monids and that this condition coincides with the time of chromosome reproduction.

694 Östergren, G. & Wakonig, T.
True or apparent sub-chromatid breakage and the induction of labile states in cytological chromosome loci.
Bot. Notiser 1954 : No. 4 : 357–75.

The authors define two phenomena as characteristic of so-called subchromatid breakage induced by X rays and other agents: (1) constrictions and the formation of attached fragments distal to the constrictions and (2) apparent subchromatid interchange. These two effects, it is suggested, are the outcome of breakage of entire chromatids which are spiralized and covered with matrix, connexion of the portions associated before breakage being maintained by the matrix. Experiments in which chromosome breakage was induced in root-tip nuclei of *Allium cepa* by coumarin treatment have provided some support for the above interpretation. In a number of these experiments colchicine was applied in addition to coumarin to facilitate the recognition of the different cell generations by means of the tetraploid condition. Coumarin induced breakage only in dividing nuclei. In the first-generation cells the effects of this chemical consisted preponderantly of the "subchromatid-breakage" type. In the next cell generation, however, the changes were almost exclusively of the chromosome type, i.e. affecting both chromatids.
The occurrence of induced constrictions affecting both chromatids at the same locus in many cells of the second generation suggests that the coumarin induced a labile state in some loci during the previous mitosis, each of these loci having reproduced during the resting stage to give two labile sister loci at which breakage occurred during the succeeding prophase.
After discussing some relevant results obtained by other investigators of chromosome breakage, the authors attempt to explain why the chromatids behave as units in breakage and reunion in spite of their multiple constitution, postulating the transmission of some kind of impulse affecting all the subunits as the result of an appropriate stimulus. They further suggest that crossing-over and induced breakage are closely related phenomena.

695 Castro, D. de & Mello-Sampayo, T.
Poliploidia induzida, pontes e fragmentação em "*Luzula purpurea*." (**Induced polyploidy, bridges and fragmentation in *L. purpurea*).**
Genet. iber. 1953 : **5** : 3–22.

Colchicine treatment led to the production of over 76% of tetraploids, which morphologically were almost indistinguishable from the diploids. Triploids, polyploids of higher degrees showing growth anomalies and various heteroploids were also obtained and their behaviour at meiosis is described. Different chromosome numbers were sometimes found in different flowers of the same inflorescence or even in different pollen mother cells of a single anther. Anaphase bridges and fragments were observed among the anomalies of division.

696 Gentcheff [Genčev], G.
(**A new technique of inducing polyploidy in plants by colchicine treatment**).
God. sofiĭsk. Univ. agron.-les. Fak. (Ann. Sofia Univ. Fac. Agron. For.)/Annu. Univ. Sofia Fac. Agron. Sylvic. 1946–47 : **25** : Kniga **1** : 193–206. [Bulgarian].

A reliable method of producing polyploids from small seed samples or single plants, especially when dealing with the Gramineae and Liliaceae where the growing tip is covered by the leaves, is described. The experimental material comprised different varieties of rye and barley. Young plants 4–6 cm. long were put upside down in a glass containing 0·125% aqueous solution of colchicine so that the coleoptiles were immersed in the solution. The plants were then placed in their container under a vacuum for 5–10 minutes and left in the same position for a minute or so after being taken out of the vacuum so that the air remaining in them might be replaced by the solution. The treatment may be repeated after 24 hours.

697 Gavrilova, O. M.
(**Brief outline of the history of the question of the role of the number of sexual elements in fertilization**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1954 : No. 5 : 110–21. [Russian].

Numerous cases of polyspermy described in the literature of the late nineteenth and early twentieth century are referred to and the evidence that the additional sperms all degenerate is regarded as insufficient; many more recent researches have shown that their presence at least is necessary for the successful development of the embryo. In plants, several authors are cited as having observed fertilization of nucellar cells and of somatic cells in the tissue surrounding the nucellus as well as of the egg cell itself.

698 Marks, G. E.
An aceto-carmine glycerol jelly for use in pollen-fertility counts.
Stain Tech. 1954 : **29** : p. 277.

The preparation and use of an acetocarmine glycerol jelly in making permanent preparations for pollen-fertility counts is described. The technique has been successfully applied to tuberous species of *Solanum* at the Potato Genetics Station, Cambridge, England.

699 Christensen, E.
An improved sealing wax for temporary smear preparations.
Stain Tech. 1954 : **29** : 197–200.

A mixture of polyethylene glycol 4000 (Carbowax 4000) and gum mastic has been found to possess several advantages over paraffin-mastic for sealing temporary smear-preparations.

700 Lima-de-Faria, A. & Bose, A.
Spectrophotometric analysis of acetocarmine solutions.
Hereditas, Lund 1954 : **40** : 419–24.

The authors recommend the use of a series of five or more solutions of different concentrations whose staining properties have been determined by means of a photoelectric spectrophotometer. Such a series can be used as the basis of obtaining information on the staining properties of a new sample of dye and of discovering the most suitable concentration for studying the chromosomes at a given stage of nuclear division and in any particular species.

701 Lesins, K.
Procedure to facilitate chromosome counts in difficult plant material.
Stain Tech. 1954 : **29** : 261–64.

Lucerne, sunflower and flax are among the plants to which the following technique has been successfully applied. The root system is chilled by placing pots containing growing plants in melting ice or snow overnight at room temperature. Excised root tips are fixed in 1 : 3 acetic-alcohol for 0·5 to 3 hours. The material is then mordanted in a mixture of 7 parts alcohol plus 2½ parts of 3% ferric ammonium sulphate for 3 hours to overnight; this solution may also be used as a storage fluid for flower buds. Deep coloration of the chromosomes is obtained by staining in acetocarmine for 10–15 minutes, after which the tissues are softened by heating in acetocarmine diluted with 3 parts 45% acetic acid. The technique can be applied to flower buds, omitting the cold treatment

and with longer periods of fixation and mordanting.

DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

702 Nelson, T. C. & Lederberg, J.
Postzygotic elimination of genetic factors in *Escherichia coli*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 415–19.

Nondisjunctional diploids from crosses of genetic constitution $F^+Mal_1^-S^s$ x $F^-Mal_1^+S^+$ and $F^-Mal_1^-S^s$ x $F^+Mal_1^+S^+$ were hemizygous for the Mal_1 and S loci. About 80% of the offspring derived these loci from the F^- parent. It is concluded that one of the Mal_1^-S segments is preferentially eliminated by a postzygotic process, the segment from the F^+ parent being most liable to be affected.

703 Hotchkiss, R. D. & Marmur, J.
Double marker transformations as evidence of linked factors in desoxyribonucleate transforming agents.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 55–60.

Experiments on the exposure of pneumococci to deoxyribonucleic acid (DNA) preparations derived from a donor strain suggested that a specific genetic locus for response to streptomycin and another affecting manitol utilization were closely associated within the same DNA particle.

704 Clowes, R. C. & Rowley, D.
Some observations on linkage effects in genetic recombination in *Escherichia coli* K-12.
J. gen. Microbiol. 1954 : **11** : 250–60.

"Further recombination data have been obtained from matings involving different F^+ auxotrophic mutants of *Escherichia coli* strain K–12 with the same K–12 F^- auxotroph. Variations in the distribution of sugar fermentation markers among the progeny have been explained by the influence of the 'contra-selected' F^+ auxotrophic marker. It is suggested that the data support the conception of a single linear chromosome in K–12, which fragments randomly during recombination." [Authors' summary.]

705 Braun, W. & Whallon, J.
The effects of DNA and enzyme-treated DNA on bacterial population changes.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 161–65.

Treatment of *Brucella abortus* with deoxyribose nucleic acid isolated from various smooth and nonsmooth strains of this organism, combined with addition of deoxyribose nuclease to the cultures, affected the genotypic composition of a population but did not cause any particular transformations.

706 Shirling, E. B.
Studies on relationships between actinophage and variation in *Streptomyces*.
Diss. Abstr. 1954 : **14** : Publ. No. 7725 : p. 588. (Abst.).

Evidence was obtained suggesting that a significant number of *Streptomyces* isolates obtained from soil may be phage carriers and that some of the variability found in this group and related genera may be associated with phage lysis. Shifts in host-phage equilibrium, resulting in variability in colony type, appeared to be under genetic control. The effects of phage filtrates from soft variants upon the less lytic parental type suggested the occurrence of phage mutation.

707 Ryan, F. J. & Wainwright, L. K.
Nuclear segregation and the growth of clones of spontaneous mutants of bacteria.
J. gen. Microbiol. 1954 : **11** : 364–79.

In experiments on spontaneous mutation from the histidine-requiring condition (h^-) to histidine independence (h^+) in *Escherichia coli*, the rates of increase in the proportion of mutants, initially and during serial transfer, showed discrepancies with the values expected according to the assumption that mutant and parental bacteria grew at equal rates. The data were consistent with the hypothesis that mutation occurred independently in one of the four nuclear bodies assumed to be present in each bacterium, the mutant nucleus being "dominant" over its sister nonmutant nuclei in the heterocaryon so formed. A delay of two generations would thus ensue before the mutant nucleus segregated into a homocaryotic descendant and could undergo increase. A method is given of eliminating the source of error in calculating the mutation rate when a segregation lag is involved. It is pointed out that since bacteria may be multinucleate the rate of mutation per bacterium per generation is not the same as the rate of mutation per mutable nucleus per generation.

708 Ryan, F. J., Fried, P. & Schwartz, M.
Nuclear segregation and the growth of clones of bacterial mutants induced by ultraviolet light.
J. gen. Microbiol. 1954 : **11** : 380–93.

Experiments on the induction of the mutation

from the h^- to the h^+ condition in *Escherichia coli* provided further support to the hypothesis that a segregation lag of two generations retards the onset of the increase in the number of the mutants and that the h^+ condition is "dominant" in the heterocaryon (cf. Abst. 707). The newly mutated h^+ gene is capable of evoking the development of the h^+ phenotype with hardly any phenotypic lag and without growth.

709 Ryan, F. J.
The delayed appearance of mutants in bacterial cultures.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 178–86.

Mutants of *Escherichia coli* newly arising after high doses of ultraviolet irradiation undergo a variable delay in the onset of division that lasts for many generations after the non-mutated bacteria have begun to divide. In this respect such mutants also differ from old mutants that have begun to grow before irradiation. The duration of the delay is too long to be accounted for by a lag in nuclear segregation or by a biochemical requirement for the development of the mutant phenotype. It is suggested that the mutations occurred only among a fraction of irradiated bacteria receiving an injury that at the same time delayed growth and made mutation likely. This phenomenon may account for other cases of delayed appearance of mutants in cultures exposed to mutagens.

710 Newcombe, H. B. & McGregor, J. F.
Dose-response relationships in radiation induced mutation. Saturation effects in *Streptomyces*.
Genetics 1954 : **39** : 619–27.

In *Streptomyces* the dose-response relationship for mutations induced by either ultraviolet or ionizing radiations is nonlinear, whereas in other organisms the dose-response relationship is nonlinear for ultraviolet radiation but linear for X rays. In the case of ultraviolet radiation of *Streptomyces*, evidence was obtained that the photoreversible intermediate in the mutation process increases linearly with increasing dose. The subsequent nonlinear mutational response may be due to differential survival or to saturation of an intracellular activity. The effect of combined treatment with ultraviolet and ionizing radiation was less than additive; the saturation effects associated with both types of radiation therefore have a common cause. It is suggested that the apparently linear curves for X-ray response in other organisms may be nonlinear at doses too high for convenient study and that X rays may act through the production of a photostable intermediate.

711 Pratt, D., Wyss, O. & Schorlemer, W. C.
A method for measuring mutagenic action.
J. gen. Microbiol. 1954 : **11** : 333–40.

A procedure for determining the mutagenic effect of irradiation upon bacteria is described. It involves dilution of the irradiated suspensions and subculturing of the dilutions in flasks containing broth, so that the number of induced mutants in an irradiated suspension may be calculated on the basis of the fraction of the subcultures containing a number of mutants not above that of spontaneous mutants, and the average number of induced mutants inoculated per flask. The method has the following particular advantages: (1) it permits the phenotypic expression of all potential mutants for a given property; (2) the influence of selective effects during subculture is minimized; (3) it provides a sufficiently large population for detecting rare mutants when mutagenic procedures of a high degree of lethality are employed; and (4) it makes possible the study of diverse types of mutants.

712 Gaines, S.
Comparative studies of variants of *Micrococcus aureus* obtained by exposure to radiophosphorus.
Abstr. Diss. Ohio Univ. 1950–51 (1954) : No. 65 : 81–85.

Many types of variants were induced by treatment with P^{32}, alterations being observed in colony morphology, fermentative abilities, nutritional requirements, sensitivity to bacteriophage, pigment formation, pathogenicity, coagulase production and other physiological properties. With few exceptions, the characteristics of the variant cultures remained stable during prolonged subculturing.

713 Berrie, A. M. M.
The effects of temperature on ultraviolet-induced mutability in *Escherichia coli*.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1125–33.

Dose-efficiency curves were determined for reverse mutation of several auxotrophs and a streptomycin-dependent strain when exposed to temperatures of 15° and 37° C after ultraviolet irradiation. In all the strains tested, a lower frequency of mutants was obtained at 15° than at 37°. With the former temperature

during posttreatment, the frequency of mutants increased in an exponential manner as the dose of ultraviolet increased; with the latter temperature the rate of increase showed a linear relationship with dose. The bearing of these findings upon the possible nature of the mutagenic action of ultraviolet irradiation is discussed.

714 Loĭcjanskaja, M. S.
(Variability of acetic acid bacteria).
Mikrobiologija (Microbiology), Moskva 1953 : **22** : 511–16. [Russian].
Smooth forms of *Acetobacter acetovorum* with a low degree of tolerance of acetic acid were obtained when rough strains were cultured upon media with a low acetic acid content.

715 Imšeneckiĭ, A. A. & Kuzjurina, L. A.
(Using rough strains of acetic acid bacteria for oxidation of sherbet).
Mikrobiologija (Microbiology), Moskva 1954 : **23** : 159–65. [Russian].
Rough forms of *Acetobacter suboxidans* and *A. melanogenum* have been selected. They are more productive and active than the parental smooth strains.

716 Clark, J. B. & Webb, R. B.
Mitosis-like figures in *Corynebacterium pseudodiphtheriticum*.
J. gen. Microbiol. 1954 : **11** : 394–97.
Combined study of the cell wall and nucleus in *C. pseudodiphtheriticum* showed that many mitosis-like configurations were divided by cross septa.

717 Formal, S. B., Baron, L. S. & Spilman, W.
Studies on the virulence of a naturally occurring mutant of *Salmonella typhosa*.
J. Bact. 1954 : **68** : 117–21.
The virulent strain of *S. typhosa* was found to require cysteine and tryptophane for growth, while its spontaneously occurring avirulent mutant required purine in addition to cysteine and tryptophane.

718 Dean, A. C. R. & Hinshelwood, C.
The stability of various adaptations of *Bact. lactis aerogenes (Aerobacter aerogenes)*.
Proc. roy. Soc. 1954 : Ser. B. : **142** : 45–60.
Stability of resistance to the drugs propamidine, proflavine and chloramphenicol and stability of enzymatic adaptation to acetate medium were almost completely lost in the absence of the inducing agent, such loss involving a highly complex pattern of behaviour. It is suggested that reversal of an adaptation during detraining is more satisfactorily explained by postulating changes in enzyme proportions and metabolic pathways than by the theory of mutation and selection.

719 Dean, A. C. R. & Hinshelwood, C.
The adaptation of *Bact. coli mutabile* to lactose.
Proc. roy. Soc. 1954 : Ser. B. : **142** : 225–41.
The view that adaptational phenomena in bacteria are better explained in terms of the reaction pattern of the cell than by the hypothesis of mutation and selection is further supported by data on lactose adaptation. The number of lactose positive (lac^+) colonies appearing on a lactose-agar plate from an unadapted culture bore no relation to the proportion of assumed mutants in the culture but was a complicated function of inoculum size. The time of appearance of lac^+ colonies was much longer than for a culture previously grown in lactose; no evidence was obtained that lac^+ cells were inhibited by the presence of an excess of lac^- cells. When cells were first placed in a liquid lactose medium and samples transferred at intervals during the ensuing lag phase, the time needed for colony development on lactose-agar progressively diminished. The growth rate of newly adapted strains was at first variable.

720 Dean, A. C. R. & Hinshelwood, C.
Competitive growth of lactose-positive and lactose-negative strains of *Bact. coli mutabile*.
Proc. roy. Soc. 1954 : Ser. B. : **142** : 471–82.
Lac^+ strains have not been found to revert to the lac^- condition even after a long time; thus when artificial mixtures of lac^- and lac^+ strains are grown in a glucose medium competition occurs as between two independent types. The predominance of one type over the other is determined not by the initial proportions of the strains, as the theory of periodic selection suggests (cf. *PBA*, Vol. XXI, Abstr. 2386), but by the relative degree of general adaptation of the strains to the medium.

721 Kalina, G. P.
(Embryogeny and ontogeny of microorganisms).
Mikrobiologija (Microbiology) 1953 : **22** : 723–29. [Russian].
Ierusalimskiĭ's thesis that transfer to a fresh medium causes a renewal of the phases of

ontogeny in microorganisms is denied; this, it is maintained, occurs from precellular matter which can be filtered from old cultures and gives rise first to granular forms and then to cells, in accordance with the conceptions of Lepešinskaja (cf. *PBA*, Vol. XXI, Abst. 1509).

722 DE HAAN, P. G.
Genetic recombination in *Escherichia coli* B. I. The transfer of the F agent to *E. coli* B.
Genetica 1954 : **27** : 293–300.

By serial transfer of mixed cultures, the agent for the F^+ mating type was transferred from *E. coli* K12 to F^- nutritional mutants of *E. coli* B. Strain B was less susceptible to F^+ transfer than K12. Such a transfer in strain B occurred much more frequently than recombination. The fertility of crosses between mutants of B was similar to that of crosses between mutants of K12. It is concluded that F^+ transfer and recombination are separate phenomena.

723 DE HAAN, P. G.
Genetic recombination in *Escherichia coli* B. II. The crossresistance of *E. coli* B to the phages T_3, T_4 and T_7.
Genetica 1954 : **27** : 300–08.

Previous investigations indicated that *E. coli* B had mating type F^- (cf. Abst. 722). With the transfer of the F^+ agent to several auxotrophic mutants of B, fertile crosses could be made for the genetical study of resistance to T_3, T_4 and T_7. Data from crosses of phage-sensitive strains with strains possessing resistance to T_3 and T_4 or all three phages indicated that each of these two patterns of resistance behaved as a single genetic character. The parents fell into two broad classes, with 65–75% and 6–30% transfer, to the prototrophic progeny, of the reaction of the F^+ parent to T_3. In tests for allelism between resistant strains belonging to the same group only a few sensitive colonies were obtained, whereas intergroup crosses produced many sensitives. All loci governing resistance to T_3, T_4 and T_7 were apparently closely linked with the locus for methionine utilization; several reasons for doubting the validity of this linkage are however briefly discussed.

724 LABRUM, E. L.
The effect of generation time on the delayed appearance of induced mutants in *Escherichia coli*.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1221–27.

The patterns of delayed appearance of $MnCl_2$-induced mutants resistant to phage T5 were determined in the tryptophane-requiring strain B/1t/f when maintained at different generation times at a constant temperature. It was concluded that, regardless of generation time, the delayed appearance of induced T5-resistant mutants is characterized by an initial phase, during the early cell-divisions, when the mutants appear at a low but gradually increasing rate; during the succeeding phase, the mutants appear at a high linear rate that is constant per unit time. Irregularity in the time of onset of division of individual cells may possibly be a factor determining the rate of appearance of the mutants during this second phase.

725 RAUTENŠTEĬN, JA. I.
(Obtaining phage-resistant cultures of *Actinomyces* by directed training).
Mikrobiologija (Microbiology), Moskva 1954 : **23** : 252–60. [Russian].

Strains of *A. globisporus* that had acquired resistance to certain phages transmitted this character to succeeding generations grown in phage-free cultures.

726 WHEELER, H. E. & PONTECORVO, G.
Genetics of homothallic fungi.
Science 1954 : **120** : 718–19.

Wheeler expresses the view that, in their recent paper, Pontecorvo *et al.* (cf. *PBA*, Vol. XXIII, p. 663) are incorrect in referring to *Aspergillus nidulans* as the first homothallic fungus to be investigated genetically and in claiming that relative heterothallism is a newly discovered phenomenon. According to Wheeler, the validity of these assumptions is questionable in view of the genetic studies already carried out on *Glomerella*. In replying to this criticism, Pontecorvo maintains that genetic analysis on a large scale has only become possible with the development of his technique of recombinant selection (cf. *PBA*, Vol. XIX, Abst. 2412). He also questions Wheeler's equation of relative heterothallism with cross caryogamy.

727 JINKS, J. L.
Somatic selection in fungi.
Nature, Lond. 1954 : **174** : 409–10.

The author reports the occurrence of progressive and reversible changes in the frequencies of formation of asexual spores in *Aspergillus nidulans* and *Penicillium cyclopium* when subcultured under appropriate selective conditions. He ascribes these changes to alterations in the cytoplasm, possibly as the result of the non-random distribution of its components. The control of the cytoplasm by the nucleus is

considered to be less strict in the fungi than in the higher organisms.

728 Brockaja, S. Z.
(Proteolytic activity of a rough form of *Aspergillus niger*).
Mikrobiologija (Microbiology), Moskva 1954 : **23** : 153–57. [Russian].

Strain AN5, mentioned previously in connexion with its amylolytic properties (cf. *PBA*, Vol. XXIII, Abst. 2420), also showed an increased capacity for breaking down protein.

729 Weijer, J.
A genetical investigation into the *td*-locus of *Neurospora crassa*.
Genetica 1954 : **27** : 173–252.

Investigations were carried out on the problem of whether recombination by means of crossing-over occurs within the *td* locus for tryptophane utilization, using 24 td^- mutants (cf. *PBA*, Vol. XXIV, Abst. 1669). The rates of spontaneous or ultraviolet-induced reversion of the different *td* strains to tryptophane independence varied considerably; in general the correlations between the rates of spontaneous and induced reversion were slight. Mutants of the type td^-su (suppressor) occurred in the reversion tests. Irregular Mendelian segregation ratios, a low percentage of spore germination and the occurrence of abortion patterns of the spores in the progenies from crosses of td^- strains with fl^- (fluffy) td^+ suggested that the majority of the mutants may carry chromosomal rearrangements. Genetical proof of the existence of chromosomal rearrangements was not possible because the marker system available was inadequate. Phenotypically tryptophane-independent types appeared among the progenies of crosses between td^- mutants. The author discusses several possible causes of this phenomenon but finds none satisfactory as an explanation, including the possibility of crossing-over in the *td* region since segregation for the very closely linked marker *fl* occurred in many of the crosses. The inheritance of the temperature-sensitivity of the mutant td^-24 could not be adequately explained on a Mendelian or cytoplasmic basis. It is suggested that the ability of this mutant to grow on minimal medium at 30° C. depends upon (1) the genetical constitution and (2) a nongenetical mechanism not restricted to the mutant. Temperature sensitivity may be related to the membrane property of the chromosome matrix. It is concluded that the *td* locus is complex, probably consisting of several subunits.

730 Mitchell, M. B. & Mitchell, H. K.
A partial map of linkage group D in *Neurospora crassa*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 436–40.

From a study of 2-point and 3-point crosses involving biochemical mutants, the following order has been inferred for genes situated on one arm of chromosome D: centromere-*pyr* 1 – *pdx* – *co* – *arg* – *pyr* 3 – *ad* – *pan* – *cot* – *hist* – *pyr* 2 – *dn*.

731 Newmeyer, D.
A plating method for genetic analysis in *Neurospora*.
Genetics 1954 : **39** : 604–18.

The following plating technique has proved to be a labour-saving method of identifying alleles, detecting linkage and determining approximate map distances in studies of biochemical mutants. Ascospores are plated on a minimal agar medium containing sorbose to induce colonial growth, with or without the addition of the required growth factors. The recombination frequency is determined from the proportion of colonies produced on the supplemented and unsupplemented plates. An extension of the method permits the use of a triply marked linkage-tester stock, without necessitating an increase in the number of test media required.

The technique was applied to 37 tryptophane-requiring mutants, which were found to represent mutations at only five loci, designated *tryp*–1, *tryp*–2, *tryp*–3, *tryp*–4 and *nt*. The locus *tryp*–2 is situated in linkage group VI and *tryp*–4 in group IV. Previous investigators have shown that *tryp*–1 and *tryp*–3 are located in groups III and II, respectively. It has already been reported that *nt* belongs to group VII (cf. *PBA*, Vol. XXIV, Abst. 1665).

732 Fincham, J. R. S.
Effects of a gene mutation in *Neurospora crassa* relating to glutamic dehydrogenase formation.
J. gen. Microbiol. 1954 : **11** : 236–46.

Further experiments on two strains requiring α-amino nitrogen for growth, as the result of a single-gene mutation (*am*), have confirmed the author's previous conclusions that the mutant extracts contain no detectable amount of glutamic dehydrogenase and no enzyme inhibitor (cf. *PBA*, Vol. XX, Abst. 807). A balanced heterocaryon carrying *am* nuclei and nuclei with an unrelated mutation (*pyr*) produced less glutamic dehydrogenase than the wild type of mycelium but no indication was obtained that

the *am* nuclei were suppressing the activity of the other nuclei in promoting enzyme production. The mutation *am* had little or no effect on the concentrations of two other dehydrogenases or of several transaminases. The general bearing of these results upon the role of the gene in enzyme production is discussed.

733 Hogness, D. S. & Mitchell, H. K.
Genetic factors influencing the activity of tryptophan desmolase in *Neurospora crassa*.
J. gen. Microbiol. 1954 : **11** : 401–11.

Mutant C83 is characterized by loss of the tryptophane-desmolase activity necessary for the synthesis of tryptophane from indole and serine (cf. *PBA*, Vol. XIX, Abst. 160). No difference could be detected between the tryptophane desmolase extracted from a back-mutated strain of C83 and that of the wild type. The concentration of this enzyme may however be affected by a gene or genes other than the mutation responsible for tryptophane requirement. C84, a single-gene mutant for histidine requirement (H^-), possessing a tryptophane-desmolase activity two to three times greater than that of the wild type 8a, was crossed with this wild type. The H^+ progeny resembled the wild type with respect to tryptophane-desmolase activity; the H^- progeny could be broadly classified into two groups, one having the high specific activity characteristic of C84, and the other no activity. This lack was apparently due to an inhibitor of tryptophane-desmolase catalysis.

734 Woodward, V. W., De Zeeun, J. R. & Srb, A. M.
The separation and isolation of particular biochemical mutants of *Neurospora* by differential germination of conidia, followed by filtration and selective plating.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 192–200.

Details of a method of recovering biochemical mutants of *Neurospora* are given (cf. *PBA*, Vol. XXIII, Abst. 938). Experiments on synthetic mixtures of conidia of the wild type and known mutants have shown that the described method does not permit the recovery of all mutant types with equal efficiency and may not even permit any recovery of certain types. The data suggest, however, that mutant conidia from irradiated populations are less readily lost than those from synthetic mixtures; this apparent anomaly arises from the different sets of conditions under which the two types of experiments are performed. The following are suggested as possible factors affecting the recovery of mutant conidia: (1) prevention of mutant spores from passing through the filter by mechanical difficulties, (2) the production of mycelia nutritionally equivalent to the wild type as the result of heterocaryosis, (3) failure of the mutant spores to survive in liquid media for extended periods, (4) cross-feeding of metabolites and (5) conditions of aeration.

735 Barratt, R. W. & Ogata, W.
A strain of *Neurospora* with an alternative requirement for leucine or aromatic amino acids.
Amer. J. Bot. 1954 : **41** : 763–71.

Investigations of the variant H6196 induced by S^{35} (cf. *PBA*, Vol. XXIII, Abstr. 931) indicated that the strain contained a mutation (*phen*) resulting in a nutritional requirement satisfied by any one of several structurally unrelated aminoacids. The locus *phen* is situated in linkage group I, 3·4 units from the centromere and proximal to *sex*. It is suggested that the metabolic defect of the strain leads to the accumulation of an inhibitor, the action of which is reversed by any one of the compounds supporting growth.

736 El-Ani, A. S.
Chromosomes of *Hypomyces solani* f. *cucurbitae*.
Science 1954 : **120** : 323–24.

The author's findings lend no support to those of Hirsch (cf. *PBA*, Vol. XVIII, Abst. 776 and Vol. XIX, Abst. 2422) and he concludes that all four sexual forms of this fungus have the same chromosome number ($n = 4$).

737 Atwood, K. C. & Mukai, F.
Indispensable gene functions in *Neurospora*.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1027–35.

The proportion of mutants which had lost indispensable functions was higher among mutants obtained by the heterocaryon method (cf. *PBA*, Vol. XX, Abst. 802) than among those isolated by the temperature technique. In the latter method, use is made of mutants unable to grow on minimal medium at certain temperatures but which are capable of being maintained on any medium at a favourable temperature; those which do not grow on complete medium are considered to show an irreparable loss of an indispensable function. To explain their result, the authors postulate a class of genes which, on account of their action

or products, are exempt from mutation involving sensitivity to temperature. Practically all members of this class are believed to control indispensable functions; possibly they have no role in enzyme synthesis, or are only indirectly concerned in such synthesis, through the formation of complex intermediates. It is further suggested that this class is numerically larger than the class of genes whose functions can be surmised in a general way from studies of biochemical mutants. The hypothesis of one gene to one enzyme is still tenable in principle if interpreted according to a relationship of one gene to one action.

738 Gilliland, R. B.
A study of a wild yeast—*Saccharomyces diastaticus*.
Wallerstein Labs. Commun. 1954 : **17** : 165–76.

The yeast *S. diastaticus*, producing very low specific gravities in wort or beer, differs from *S. cerevisiae* in being more variable in size and shape, more heat-resistant and in its ability to ferment starch and dextrin. The flocculent type of *S. diastaticus* is homozygous for a dominant gene, *F*, determining flocculence; the nonflocculent type is homozygous for *f*. With respect to the following genes both types are homozygous: *G* for rapid fermentation of galactose, also occurring in *S. italicus*; R_2 for fermentation of raffinose and ability to ferment sucrose rapidly, also occurring in *S. cerevisiae* and *S. chevalieri*; M_1 for rapid fermentation of maltose and slow fermentation of sucrose, also found in *S. italicus* and *S. cerevisiae*; M_5 for slow fermentation of maltose (cf. *PBA*, Vol. XXIV, Abst. 1686); and *S* for amylase production (cf. *PBA*, Vol. XXIV, Abst. 2969). Both types are heterozygous for a recessive lethal gene, *l*.

739 Tobias, C. A.
Remarks on the radiosensitivity of unicellular organisms.
Acta radiol., Stockh. 1954 : **41** : 105–08.

The results of investigations at the Donner Laboratory of the University of California on the biological effects of irradiation with α and deuteron particles upon the heritable characteristics of haploid and diploid strains of *Saccharomyces cerevisiae* are summarized. Sensitivity to irradiation was found to be greater in haploid than in diploid cells and deuteron particles considerably more effective than α particles in effecting mutations. The above findings are discussed in the light of radiobiological work on microorganisms undertaken elsewhere.

740 Sarachek, A.
X-ray inactivation of *Saccharomyces* during the budding cycle.
Experientia 1954 : **10** : 377–78.

Data on X-ray inactivation of budding cells of a tetraploid strain provide additional support to the view that such inactivation is to a large extent the consequence of induced chromosomal aberrations (cf. *PBA*, Vol. XXIV, Absts. 881 and 2710).

741 Eddy, A. A. & Hinshelwood, C.
Further observations on galactose adaptation of yeast strains.
Proc. roy. Soc. 1954 : Ser. B. : **142** : 32–44.

Previous observations on galactose-positive and galactose-negative strains of *Saccharomyces cerevisiae* are amplified (cf. *PBA*, Vol. XXII, Abst. 964 and Vol. XXIV, Absts. 2704 and 2708). The negative character is not absolute since growth usually occurs after a certain time has elapsed. An adapted negative haploid strain which has had only a few passages through galactose is unstable and reverts during passage through glucose. Further subculture in galactose, however, leads to a high degree of persistence of adaptation to galactose. Positive haploid spore segregates from a completely adapted positive diploid strain require adaptation before showing their optimum growth rate in galactose. As previously found, two negative haploids may mate to yield a galactose-positive diploid. The range of behaviour of the derived haploids with respect to galactose utilization has varied according to the hybrid; in one case a few positive segregates and a majority with a much longer lag were obtained. The view is expressed that such variable behaviour is best explained by a theory involving the cell organization as a whole rather than by a mutation-selection hypothesis.

742 Eddy, A. A.
The role of mutation in the adaptation of a yeast to galactose.
Proc. roy. Soc. 1954 : Ser. B. : **142** : 267–387.

Adaptation of a diploid strain of *Saccharomyces cerevisiae* to a medium containing galactose was found to involve the selective growth of a few cells that had mutated to a condition enabling this sugar to be utilized readily, rather than the gradual development of the ability to utilize galactose by the majority of cells. Adapted and nonadapted diploids differed by a single gene for galactose utilization. The strain retained its ability to grow optimally in

galactose after prolonged subculturing in a glucose medium. The theories of induced adaptation and of a mutation combined with selection are however not regarded as mutually exclusive.
It is suggested that a new mutation entails a temporary period of reorganization, when the coordination of cell reactions is disturbed sufficiently to prevent the growth rate in any medium from reaching its maximum value; this may account for the failure of mutant and nonmutant cells to attain proportional equilibrium during subculturing of an unadapted strain.

743 Loginova, L. G. & Vasilevskaja, M. M.
(The rate of reproduction of thermophilic yeasts obtained experimentally).
Mikrobiologija (Microbiology), Moskva 1954 : **23** : 410–18. [Russian].
The thermophilic strain referred to in *PBA*, Vol. XXIII, Abst. 2439, multiplied more rapidly at 28–30° C and 40° C than its parent strain.

744 Perlman, D. & O'Brien, E.
Characteristics of a cobalt tolerant culture of *Saccharomyces cerevisiae*.
J. Bact. 1954 : **68** : 167–70.
A strain of *S. cerevisiae* resistant to cobalt was obtained at the Squibb Institute for Medical Research, New Brunswick, NJ, by growing yeast in media containing progressively higher concentrations of inorganic cobalt. No changes in morphology, nutritional requirements or sensitivity to 1-hydroxy-2(1H) pyridinethione or cycloheximide were observed.

745 Wild, D. G. & Hinshelwood, C.
The behaviour in presence of phenol or thymol of a strain of *Saccharomyces cerevisiae*.
Proc. roy. Soc. 1954 : Ser. B. : **142** : 427–36.
Addition of phenol to the medium lowered the growth rate without any appreciable initial lag; improvement in the growth rate upon repeated culture was not marked. In contrast thymol induced a long initial lag which was rapidly eliminated by training. As the yeast became adapted to thymol it progressively lost the power of sporulation; when detrained it gradually regained this ability. An adaptive response is thought to be a more probable explanation of the development of thymol resistance than the selection of mutants.

746 Mittwoch, U.
The genetics of *Coprinus lagopus*. I. The formation of monokaryons from dikaryons.
J. Genet. 1954 : **52** : 547–50.
"Instances are described in which mutant x normal dikaryotic mycelia reverted to the monokaryotic condition. Usually it was the mutant component which was lost, but in one instance the mutant was recovered, the normal component being lost.
"Differences and similarities between dikaryons and heterokaryons are discussed."
[Author's summary.]

747 Mittwoch, U.
The genetics of *Coprinus lagopus*. II. Growth rates of wild-type strains.
J. Genet. 1954 : **52** : 551–54.
"The growth rates of four monokaryotic strains of *Coprinus lagopus* and two dikaryotic strains made from them, were measured at two different hydrogen-ion concentrations (pH 6 and pH 8) at three different dates.
"The results indicated differences in growth rate between strains, as well as between hydrogen-ion concentrations, the rates being faster at pH 8 than at pH 6. In some instances the growth rate of the same strain at different dates was also different.
"The growth rates of the dikaryons was correlated with those of the component monokaryons, the dikaryons being intermediate between the monokaryons, but with a tendency to approach the faster growing strain."
[Author's summary.]

748 Miczyński, K. A.
Badania nad zmiennością wirusa ziemniaczanego "X" pod wpływem ultradźwięku. (**Studies on the mutability of virus X of the potato under the influence of ultrasonic waves**).
Acta Soc. Bot. Polon. 1954 : **23** : 289–320.
Treatment with ultrasonic waves lessened the virulence of a race of potato virus X causing severe necrotic and mosaic symptoms in tomato plants. The decrease in virulence was proportional to the duration of treatment and was more pronounced when the vibration frequency was high than when it was low. The change in virulence of the virus appeared to be heritable.

749 Welsh, J. N. & Adams, M. H.
Photodynamic inactivation of bacteriophage.
J. Bact. 1954 : **68** : 122–27.
Kinetic studies of photodynamic inactivation of phages showed serologically related phages

to be similar in susceptibility to inactivation and the variation in sensitivity within a serological group to be too small to be of value in genetic studies.

750 STENT, G. S.
Cross reactivation of genetic loci of T2 bacteriophage after decay of incorporated radioactive phosphorus.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1234–41.

An appreciable fraction of the P^{32} disintegrations destroying the plaque-forming ability of T2 left the phage particle still able to donate some but not all of its genetic characters to the progeny of a mixed infection with an undamaged nonradioactive phage. The data suggested that the surviving loci of the P^{32}-inactivated phage began to multiply before recombination with the undamaged partner and that the eliminated loci were actually destroyed.

751 FERNANDEZ, B., HAAS, F. L. & WYSS, O.
Induced host-range mutations in bacteriophage.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 1052–57.

"An increase in the incidence of host range mutants was obtained when bacteriophage T2 was grown on a streptomycin-sensitive strain of *E. coli*. The higher the concentration of streptomycin employed the larger the increase within the limits that permitted some virus multiplication. Streptomycin did not affect the incidence of host range mutants when the phage was grown on streptomycin-resistant bacteria. Streptomycin does not appear to select in favour of the mutants and may therefore, actually induce the mutants by modifying the metabolism of the host."
[Authors' summary.]

752 RAUTENŠTEĬN, JA. I.
(Directed variability in actinophages).
Mikrobiologija (Microbiology), Moskva 1954 : **23** : 140–46. [Russian].

Heritable changes in respect of ability to cause lysis were obtained in phages of *Actinomyces globisporus* grown in liquid media.

753 FRASER, D. & WILLIAMS, R. C.
Electron microscopy of the nucleic acid released from individual bacteriophage particles.
Proc. nat. Acad. Sci. Wash. 1953 : **39** : 750–53.

"A method has been devised whereby bacterial viruses can be broken open *in situ* on an electron microscope screen in such a way that the contents of the phage are released and can be identified with a given virus particle. The fibrillar strands, which can be presumed to be the nucleic acid or chromosomal material of the virus have a diameter of 20 Å, a value which agrees closely with that obtained by other methods for the elementary fibrils of deoxyribose nucleic acid." [Authors' summary.]

CROP PLANTS

754 **The work of FAO 1953/54. A progress report.**
FAO UN, Rome 1954 : Pp. 60. (Mimeographed).

Progress in the following projects is reported in chapter II, dealing with work on agriculture:—

Wheat and barley breeding. The third meeting on wheat and barley breeding in the Near East took place at Damascus, April 1954. The cooperative uniform rust and bunt nurseries have been grown for one season and preliminary indications of wheat and barley varieties highly resistant to the races of bunt and rust prevalent in the region have already been obtained. Promising varieties are being compared with commonly grown types in small-scale yield tests with a view to early introduction of the best into general cultivation. The nurseries will also provide valuable breeding stocks for use in national hybridization schemes.

Hybrid maize. The use of hybrids in Europe almost doubled from 1952 to 1953. Data from 300 tests in 14 countries in 1951 and 1952 showed that a number of the hybrids introduced from the USA and Canada are capable of outyielding the best local open-pollinated variety by an average of approximately 50%. The seventh annual meeting of hybrid maize specialists was held in Belgrade, February, 1954.

Rice breeding. In Egypt, a programme of selection, breeding and cultural investigations is beginning to give good results.

Pasture and fodder crops. At the third meeting of the Working Party on Mediterranean Pasture and Fodder Development, held at Ankara, May 1954, the subjects discussed included (1) introduction and testing of grasses and legumes, (2) collection and breeding of indigenous strains of forage plants, and (3) locally produced supplies of seed.

Coffee. Ethiopian types have been collected for observation in both Ethiopia and the western hemisphere. A study has been made of the origin of these types.

755 **Guide to field experiments, demonstrations and farm crops of the Edinburgh School of Agriculture, 1954** : Pp. 102.

Part I provides a guide to the various experiments and demonstrations in progress. Part II summarizes the results of variety trials carried out during 1953 on winter wheat, spring oats, spring barley and forage beets on the farms of the school and at the trial centre of the National Institute of Agricultural Botany. Descriptive notes on the cereal varieties tested are given in Appendix III.

756 Russell, J.
The National Institute of Agricultural Botany: its past, present and future.
Nature, Lond. 1954 : **174** : 446–49.

The substance of an address presented at the annual general meeting of the fellows of the National Institute of Agricultural Botany, Cambridge, England, on 16 July 1954 is given. The Institute's work of testing new varieties and strains is considered in relation to its national and international significance and in relation to modern crop breeding.

757 Agócsi, P.
Három új növény magyarországon. (**Three new plants in Hungary**).
Agrártudomány 1952 : **4** : 312–20.

Kenaf. Four varieties that have been introduced into Hungary are described. In each variety, pigmented plants occurred that matured 7–15 days earlier than the normal green types.
Lallemantia iberica. A general botanical and agronomic account is given with reference to experiments at Szeged.
Luffa. *L. purgens* has been introduced into Hungary but requires to be bred for earliness in view of its sensitivity to cold.

Institut National de la Recherche Agronomique. Rapport Annuel 1951. (**National Institute of Agricultural Research. Annual Report 1951**) : 1954 : Pp. 250.

758 *Station Centrale* (*Versailles*). (*National Centre of Agricultural Research, Versailles.* (*pp.* 77–91).

Wheat. The principal aim of the breeding programme is the development of hybrids resistant to frost, foot rot and black rust. In hybrid 80–3, resistance to black rust was shown to be determined by a single dominant factor. Brief particulars of intergeneric crosses involving species of *Agropyron* and *Aegilops* are given.
Oats. A number of American introductions were tested for resistance to *Puccinia coronata* and *P. graminis.* Garry proved to be the variety least susceptible to these two diseases and was also highly resistant to loose smut. Two new varieties developed at Versailles, Pégase (Versailles x von Lochow) and Vega (V_7 x Rigel) have outyielded all commercial varieties with which they were compared. Lines combining high yields, good quality grain and resistance to lodging and loose smut have been obtained from Aigle [Eagle] x (Markion* x Binder) and from Soleil II [Sun II] x Richland. Some F_5 selections of Montferrandaise x Noire de la Plata [La Plata Black] and VI Ng49 x Burke 1–3 are distinguished by their early maturity.
Maize. Breeding for resistance to *Pythium* and *Gibberella* has been initiated. A number of hybrid lines have been developed from crosses between French and American varieties and have proved superior to hybrid introductions from the USA.
Barley. A number of lines possessing complete immunity to mildew have been selected. Progress was made in selecting for resistance to frost, loose smut, *Rhynchosporium secalis* and *Puccinia simplex.*
Forage plants. Brief information on the breeding of lucerne, clover and horse beans is given. Studies on the effects of inbreeding on the yield and vegetative vigour of *Dactylis glomerata* and lucerne are reported. Degree of awning of the lower glumes in *Lolium perenne* and *L. italicum* was shown to depend upon three pairs of alleles, viz. A_1a_1, A_2a_2 and A_3a_3. A_1 is epistatic to A_2, which is epistatic to A_3. Genes of the *A* series are linked with those of the O series, which conditions the presence or absence of auricles. The percentages of recombinations characteristic of the three linkages are 0·41, 0·50 and 0·17, respectively.
Potato. The results of a number of interspecific crosses are reported and varietal differences in susceptibility to late blight noted. *Solanum polyadenium* proved completely resistant to *Phytophthora infestans.* Tetraploid forms of *S. polyadenium* have been obtained with a view to crossing this species with *S. tuberosum.* Shamrock and X32 have displayed complete immunity to leaf roll.
Flax. The cross Dillman x (Kostroma x Crésus) has given hybrids combining high yields of

* Markton? [Editor's Note.]

straw and seed with good agronomic characters.
Hemp. A number of monecious strains have been selected from varieties of French, Italian and Yugoslav origin.
Sugar beet. Breeding for resistance to *Cercospora* and yellows and studies on male sterility are reported. A number of lines with a high degree of resistance to yellows have been developed.
Linseed. Pervenche, a new variety bred at Versailles, has proved outstanding from the point of view of yield and quality of its oil. Varietal differences in resistance to *Polyspora*, *Ascochyta* and pasmo are noted. Of the varieties tested, Svalöfs Oljalin [Svalöf's linseed] proved the most resistant to all three diseases.

759 *Station d'Amélioration des Plantes de Clermont-Ferrand.* (*Plant Breeding Station, Clermont-Ferrand*). (*pp.* 92–97).
Wheat. The primary objectives of the breeding programme are resistance to frost, rust, smut, bunt and mildew. Magdalena, a new variety recently developed at the station, is distinguished by high yields, winter hardiness and the excellent baking quality of its grain. The hybrid (Aurore [Dawn] x Janetzky) x Hybride de Bersée gives high yields and is resistant to *P. triticina* and *P. glumarum*. The results of variety trials conducted at the station are presented.
Oats. A cross between von Lochow and the land variety Grise de Craponne [Craponne Grey] has given lines that yield well on poor soils. In variety trials, Montferrandaise and von Lochow x Grise de Craponne gave the highest yields.
Maize. Data on the results of trials of a number of American varieties of hybrid maize are provided.
Barley. Breeding for resistance to frost and lodging is receiving priority. The cross Kenia x Trésor du Valay [Valay Treasure] yielded well and the quality of its grain was good. Data on the comparative yields, quality of grain and resistance to lodging of a number of varieties are presented.
Flax. In trials of dual-purpose varieties, Percello, Ile-de-France, Linkopis and Liral Crown proved superior. Formosa and Rembrandt displayed moderately good resistance to lodging.

760 *Station d'Amélioration des Plantes de Rennes.* (*Plant Breeding Station, Rennes*). (*pp.* 98–100).
Cereals. The results of trials of a large number of cereal varieties are presented.
Potato. Bintje gave the highest yields in trials conducted at the station. Muntinga 17 and Kerpondy were highly productive on rich soils.
Flax. A number of intervarietal crosses are being carried out to obtain high-yielding, early-maturing varieties.

761 *Station d'Amélioration des Plantes de Dijon.* (*Plant Breeding Station, Dijon*). (*pp.* 100–04).
Cereals. The results of trials of cereal varieties and of maize varieties for silage are presented. Soleil II [Sun II] and Rika gave the highest yields of the oats and barleys, respectively. Of the wheats, Cappelle proved the most productive. Data on varietal differences in degree of winter hardiness are noted. Yga has been crossed with line 68–2 to obtain lines combining high yield with improved quality of grain and resistance to rust and frost. The F_4 of Yga x 80–3 has given four lines equal in frost resistance to Alsace 22.

762 *Station d'Amélioration des Plantes de Colmar.* (*Plant Breeding Station, Colmar*). (*pp.* 104–05, 225–30).
Cereals. A short account of cereal varieties at the station is presented. Among the aims of the station are breeding for resistance to *Puccinia triticina* in wheat and to mildew in barley.
Potato. Krassava and Voran gave the highest yields in trials of early varieties and varieties with a high starch content, respectively.

763 *Station d'Amélioration des Plantes de Montpellier.* (*Plant Breeding Station, Montpellier*). (*pp.* 105–12).
Wheat. Data are presented on the disease resistance and possible value as breeding material of a number of introductions from North and South America.
Oats. The F_7 of Richland x Prieuré has given good results in trials. The F_3 of Mindag x Romana and of Richland x Rouge d'Afrique [African Red] displayed good resistance to crown rust, as did also the F_4 of Richland x (Z94 x Prieuré) 54 and Richland x (294 x Prieuré) III.
Maize. A number of inbred lines have been raised with a view to obtaining French hybrid varieties superior in yield to American.
Barley. Notes on the disease resistance of a number of American and French varieties and hybrids are given.
Rice. Attempts are being made to develop short-strawed, early-maturing varieties suitable for cultivation in France. The Italian variety Bellardone has proved interesting for its earliness and resistance to lodging. A number of Japanese varieties have displayed a high degree

of resistance to shattering. The crosses Balilla rouge [Red Balilla] x Sesia and Balilla blanc [White Balilla] x Balilla rouge have been undertaken to study the inheritance of red grain in rice.

Bromus inermis. Selection for resistance to frost has been undertaken and a number of comparatively resistant clones have been discovered.

764 *Station de Recherches viticoles et d'Arboriculture fruitière du Centre de Recherches agronomiques du Sud-Ouest* (*Pont-de-la-Maye* [*Gironde*]). [*Research Station for Vines and Fruit Trees of the Agricultural Research Centre for the South-West, Pont-de-la-Maye* (*Gironde*)]. (*pp.* 113–17).

Breeding work on grapes, peaches, apricots and plums is outlined. Prunier d'Ente [Ente Plum] has been crossed with Impériale [Imperial] to obtain large-fruited types suitable for cultivation in the Gironde. Data on the self and cross compatibility of a number of varieties of *Prunus domestica* are given. Crosses have been effected between high-yielding, early-maturing pedigree varieties and *Monilia*-resistant, late-maturing local varieties.

765 Poljakov, A.
(At the Čeljabinsk State Breeding Station).
Zemledelie (Agriculture) 1954 : No. 8 : 28–31. [Russian].

Wheat. New spring varieties possessing good grain quality and resistance to lodging, shedding and diseases are being tested.

Forage plants. A hardy, drought-resistant, high-yielding variety of red clover and a high-yielding strain of timothy have been developed.

Peas and beans. The hybrid pea 39H–5 has larger seeds and yields 3 c. per ha. more than Capital. Svetloželtaja 1 [Pale Yellow 1], a variety of *Phaseolus* tolerant of spring frost and giving high yields, has been selected.

Oil plants. Breeding linseed for increased yield is in progress. New varieties of sunflower that are taller, more productive and have higher oil contents than Pioner Sibiri [Siberian Pioneer] are under trial.

766 Sergeev, S. V.
(Scientific achievements applied to agriculture).
Zemledelie (Agriculture) 1954 : No. 9 : 72–77. [Russian].

New varieties of wheat, oats, maize, barley, ryegrass, pea, *Phaseolus* and soya bean that outyield previous Moldavian standards have been developed at Beljcy.

767 *Årsberättelse över Sveriges Utsädesförenings verksamhet år 1953. **(Annual report on the work of the Swedish Seed Association 1953).**
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 49–130.

The new productions handed over to the General Swedish Seed Co. for multiplication and release to the public included selections of spring and autumn wheats and of oats and the tetraploid red clover U036.

New varieties, entitled since 1953 to the designation "Original", include: Svalöfs Foderärt Bello [Svalöf field pea Bello] Svalöfs Primusåkerböna [Svalöf Primus field bean], Svalöfs Novafodersockerbeta II [Svalöf Nova fodder sugar beet II], Svalöfs Viktoriakålroe [Svalöf Victoria swede], Svalöfs Rapidorybs II [Svalöf Rapido turnip rape II], and Svalöfs ängsgröe [Svalöf smooth-stalked meadow grass].

Work at the Svalöf Institute is summarized below:—

Autumn wheat. The best commercial variety was Skandia IIIB, with Hansa a close second.

Oats. The new, early variety Blixt [Lightning] was among the highest yielding Probsteier types.

The highest yielding black oat was U01590 from Stormogul II [Great Mogul II] x Extra Klock [Extra Bell].

Rye. At Ugerup the possibility of breeding a special green-fodder rye for sandy soils is being investigated. Crosses between spring and autumn rye are being studied.

Maize. Tests of the value of commercial varieties for ensilage and of various inbred lines and single hybrids for further breeding were made. Work was begun on the raising of inbred lines and hybrid varieties from the commercial varieties found most valuable for Swedish conditions.

Barley. Work on 2-rowed barleys included combined variety and manuring trials to determine the yield, crude protein content, strength of straw and suitability for combine-harvesting of (*a*) important commercial varieties and Ymer and Bonus élites and closely related lines; (*b*) new lines from populations obtained by hybridization; and (*c*) X-ray mutants, mainly of Bonus. Plots of new X-ray mutants of winter barley and promising lines from crosses between spring and winter forms were laid out.

* An extended summary of this paper is on file at the Bureau.

Herbage plants. A new red clover of the Silo type, Sv043, exceeded Merkur in yield by 10%. Some tetraploids outyielded Merkur by about 30%, the superiority being most evident in the aftermath.

The tetraploid strains did best also in the case of the Alsike clovers.

Meadow fescue, treated with X rays, was also the subject of investigation.

Lupin. Testing of early X-ray mutants was continued as well as theoretical studies of X-irradiated material.

Root crops. Several beet strains gave record yields of as much as 14,000 kg. of dry matter per ha.

Various strains of turnips were graded on the basis of their susceptibility to club root.

Potato. *Solanum demissum* material was studied at Svalöf, where tests of *Phytophthora* resistance of 51 different varieties of potatoes, mostly new introductions, were carried out for the Committee for Collaboration on Potatoes.

Following the demonstration of the occurrence of X-ray mutants in spring, 1953, potatoes were exposed to γ rays at the Balsgård Institute.

Flax and linseed. In raising new élites of Gerda, Margareta and Kristina some improvement in earliness and in strength of straw was obtained.

Sv 51/80, derived from 01041, a selection from Rumanian linseed from Rastu, and line Sv 50/79 from 01080, of North American origin, gave high yields.

Tobacco. Lines from crosses between Swedish and American tobacco were included in yield trials and selection was carried out in some new crosses, including back crosses between the best new lines and parent varieties. The causes of degeneration in new alkaloid-free élites are being investigated.

Hops. At Svalöf new Belgian and Danish material for hybridization was planted.

Selection for earliness in the hop collection resulted in the elimination of nearly all English varieties on the ground of lateness.

In agreement with the Association for Swedish Hop Growing and the Swedish Association of Brewers, breeding is now directed towards the production of new varietal types adapted to mechanized cultivation on a large scale in southern Sweden.

The study of induced polyploidy of specially promising new strains is in progress.

Oil crops. The winter hardiness of rape and turnip rape was studied.

Experiments on spring crucifers included studies of *Brassica juncea* and *Camelina.* The best spring rape and spring turnip rape material was found among crosses between autumn and spring forms and in selections from spring rape treated with X rays. Populations obtained by crossing selections of Svalöf Primex white mustard were also tested.

Kok saghyz. After analysis of about 4500 plants some 840 were selected for crossing and the raising of new seed.

Soya bean. At Teckomatorp, Svalöf Ugra yielded 1485 kg. per ha.

Cytogenetic research

The Chromosome Division is now regularly engaged in determinations of the chromosome numbers of (*a*) artificially induced polyploids in breeding material, (*b*) polyploid commercial varieties undergoing seed control examination and (*c*) artificial polyploids among the General Seed Company's varieties of rye, Alsike and red clover and turnips.

The effect of crossing and mixing diploids and tetraploids of (*a*) rye and (*b*) clover and the influence of chromosome variation in tetraploid varieties and of aneuploids upon total yields were also studied (cf. *PBA*, Vol. XXIV, Abst. 1920).

Selection for forms with regular meiosis and consequent fertility in tetraploid spring rye has yielded promising results.

Research has been done on tetraploid red clover, rye, turnips (including the leafy turnip), sugar beet and sugar mangels and synthetic rapes and swedes; and on the reaction of different chromosomal races of timothy to various environments and on the competition between (*a*) different races of timothy and (*b*) timothy races and clover.

Male sterility is being used in experiments to breed triploid sugar beets, sugar mangels and mangels.

Polyploidization of *Trifolium* species, peas, vetch and hops, fodder carrots and various meadow grasses is also in progress and research on oats with 84 chromosomes has been resumed.

The chromosome morphology of certain X-ray mutations of barley is being studied in conjunction with cytogenetic analyses to locate the new mutations.

X-ray mutations have been reduplicated for the investigation of genetic problems in autotetraploids; some older tetraploid heterozygous chlorophyll mutants are being used to study the phenomenon of heterosis in the different types of heterozygosis (*AAAa, AAaa, Aaaa*) found in autotetraploids.

The technique of chromosome reduplication was also studied.

In collaboration with various other institutes and the Association for Breeding of Fruit Trees at Balsgård, research was continued on the production of new crop plants by the induction, under various conditions, of changes in the genotype by treatment with X rays, acute and chronic irradiation with rays from Co^{60}, fast and thermal neutrons, radium emanations, various radioisotopes (P^{32}, S^{33}, Na^{22} and Pb^{210}), mustard gas and its derivatives, as well as other chemical agents.

Some of the mutations induced were used for practical breeding and some for the study of more general genetic problems, e.g. vitality and its relation to environment; chromosomal translocation; polymorphism underlying apparently identical phenotypes; the anatomy of and genetic control of strength of straw; differences in the mutation process in diploids and polyploids; mapping of the barley chromosomes; and the phylogeny of hexaploid wheat.

Mutants of practical interest in barley, autumn wheat, oats, sweet lupin and white mustard were obtained. Similar research has been begun with X-ray treatment of smooth-stalked meadow grass and potatoes and with soya bean.

Institute for Genetic Research

The chemical basis of the superior baking quality of the tetraploid rye Dubbelstålråg [Double Steel rye] was determined.

The occurrence and effect of accessory chromosomes in varieties of diploid rye and in meadow fescue were studied and a comparative inbreeding experiment with diploid and tetraploid rye was undertaken.

Experiments on barley in which the chromosome number had been doubled were continued and the institute also collaborated in research on X-ray mutants of barley and other plants.

Detailed reports from the various branch stations and substations of the Seed Association are appended.

768 Åkerman, Å
Sveriges Utsädesförenings Västernorrlandsfilial. Dess utveckling och arbetsuppgifter. (**The Västernorrland Branch Station of the Swedish Seed Association. Its development and tasks**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 137–45.

A review is given of the origin and subsequent development of the above research station. Emphasis is laid on its value as a breeding centre situated in central Norrland and also as providing, in conjunction with the Holm Estate, facilities for the multiplication of élites of Norrland varieties, and especially of cross-pollinated crops.

769 Åkerberg, E.
Forskningsinstitutionerna vid Röbäcksdalen och norrländsk växtförädling. (**The research institutes at Röbäcksdalen and plant breeding in Norrland**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 146–52.

Owing to its geographical position, climate and conformation the region of Norrland in Sweden offers a wide range of conditions for crop production. Its full exploitation presents many and varied problems, and among the research stations, set up from time to time to advance plant production, is the Röbäcksdalen experiment station at Umeå. It is intended as a research institute for the area, operating in association with local branch stations of various other research bodies concerned with plant pathology, seed control, machinery testing, agrochemistry and horticultural field trials.

The breeding of crop plants in Norrland has hitherto been carried on by the Västernorrland, Jämtland and Luleå branch stations of the Swedish Seed Association. Some valuable varieties of field crops for Norrland have been bred at these three stations, e.g. the barleys Edda and Åsa; and the varieties of oats, Alsike clover and timothy recently awarded the designation "original" (cf. *PBA*, Vol. XXIV, Abst. 2746).

The Röbäcksdalen station, though designed and intended to serve Norrland as a whole, will be of great value for the four most northerly provinces in particular and, with mutual cooperation, for Finland and Norway as well.

770 Wiklund, K.
Sveriges Utsädesförenings Västernorrlandsfilial. Förädlingsresultat och aktuella arbetsuppgifter. (**The Västernorrland Branch Station of the Swedish Seed Association. Results obtained by breeding and present tasks**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 167–83.

The Västernorrland Station is proceeding with the study, begun prior to 1922, of local plant material grown in the district and of variation within varieties and their ecological adaptation. Special attention has been paid to type and strain formation in red and Alsike clover in

connexion with cultivation and seed production. Hardiness and persistence are also being investigated with reference to the effect of grazing on the aftermath in clover, and work on the chemical composition of herbage plants has been carried out. Wild grasses collected in the past from northern Scandinavia seem likely to prove of practical importance when crossed with improved strains.

The aims and progress made in the breeding of winter and spring wheat, autumn rye, oats, barley, peas and pasture and herbage crops at the station are outlined (cf. Abst. 767).

The need for building up a stock of resistance genes for use in breeding for improved hardiness and resistance to parasites is also an important task.

771 Wiklund, K.
Sorter framkomna som resultat av förädling vid Sveriges Utsädesförenings tre Norrlandsfilialer. (**Varieties that have originated as a result of breeding work at the three Norrland branch stations of the Swedish Seed Association**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 184–90.

Varieties of cereals, legumes and timothy bred by the above stations are listed under (1) marketed varieties and (2) new varieties submitted for certification as "original varieties" (cf. *PBA*, Vol. XXIV, Abst. 2746); the characteristics of the varieties in each group are described with notes on their genetic origin and date of release on to the market.

772 J., S.
Stora framsteg i norrländsk växtförädling. (**Great advances in Norrland plant breeding**).
Lantmannen, Stockholm 1954 : **38** : 729–30.

At a meeting of the Swedish Seed Association at Sollefteå in Västernorrland, Å. Åkerman and K. Wiklund gave addresses, the substance of which is already recorded in the articles summarized in Absts. 768 and 770.

773 D.L.F.s generalforsamling 1954. (**DLF general meeting, 1954**).
Tidsskr. Frøavl 1954 : **22** : 53–62.

According to this report of the Danish Farmers' Associations for Seed Production (DLF), plant breeding was continued on the same scale as previously (cf. *PBA*, Vol. XXIV, Abst. 918) and new strains are being tested in various trials.

Cereals. A new winter-hardy wheat, Øtofte 56, has exceeded Eroica in grain yield and has stiff straw; it will be multiplied for marketing. The new rye Sejet Kærnerug [Sejet Kernel rye], bred by the Cereal Improvement Service, gave the highest grain yield of all the varieties tested; it is now being tried in Sweden.

Beet. As a result of government trials, the Barres strain Øtofte Nova XI and the sugar mangels Rød Øtofte XI [Red Øtofte XI] and Hvid Øtofte XI [White Øtofte XI] were certified.

Vegetables. A number of vegetable varieties from Toftø were officially approved for certification.

774 Rassenlijst voor landbouwgewassen 1955. (**Varietal list of agricultural plants 1955**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1954 : **11** : 67–68.

Varieties of cereals, forage grasses, clover, root crops, bean, pea and chicory recommended for cultivation in the Netherlands in 1955 are listed, together with morphological data, details of yield and disease resistance, and particulars of breeders and seed merchants.

Principaux résultats pratiques obtenus par les essais effectués en 1953 à la Station de Recherches, de l'État, pour l'Amélioration des Plantes de Grande Culture, à Gembloux. (**Main practical results obtained in trials carried out in 1953 at the National Research Station for the Breeding of Crop Plants at Gembloux**).
Rev. Agric., Brux. 1954 : **7** : 1298–396.

775 *Moës, A. L'accroissement de la productivité des orges d'hiver.* (*Increasing the yield of winter barleys*). (*pp. 1299–301*).

Of 17 experimental crosses effected at Gembloux, 15 proved more productive than Bordia or Urania. Hybrid 13 was distinguished by its high yields and resistance to loose smut.

776 *Moës, A. La productivité de l'orge de printemps en zone limoneuse.* (*The productivity of spring barley in the Limon zone*). (*pp. 1302–05*).

Tabulated data are presented on the comparative yields of five varieties at different times of sowing.

777 *Moës, A. L'amélioration de la féverole.* (*Breeding horse beans*). (*pp. 1306–08*).

Minor, a new small-seeded variety recently developed at Gembloux, is described. It

produces approximately the same yields as Niki but matures 2–6 days earlier and is more resistant to lodging. Its 1000-seed weight varies from 350 to 450 g.

778 *Noulard, L. Essais sur variétés de froment d'hiver.* (*Trials of winter wheat varieties*). (*pp. 1309–11*).

Tabulated data on yield, maturity, length of straw, 1000-grain weight and resistance to diseases and frost are presented for 15 varieties tested during 1949–53. Ministre [Minister] gave the highest yields of all the varieties tested; of those varieties possessing a high degree of resistance to frost, Leda and Panter were the most productive. The new variety Rustique [Rustic] proved adapted to soils of medium fertility and is winter hardy.

779 *Noulard, L. Essais sur variétés de froment de printemps.* (*Trials of spring wheat varieties*). (*pp. 1312–14*).

Jufy I proved the most productive of the seven varieties and five experimental hybrids tested.

780 *Lorent, J. Essais sur variétés d'avoine.* (*Trials of oat varieties*). (*pp. 1315–17*).

The experimental hybrid R37, from Blanche du Vieux Moulin [White of the Old Mill] x Blanche Rigide [Stiff White], gave the highest yields of nine varieties and experimental lines tested.

781 *Lorent, J. Essais sur le lin à fibre.* (*Trials of fibre flax*). (*pp. 1318–22*).

Data on yield, maturity, height of plant and resistance to lodging, *Botrytis cinerea* and *Phoma* are presented.

782 *Cantillon, P. Essais sur vesce commune de printemps.* (*Trials of common spring vetch*). (*pp. 1323–25*).

A brief account of selection in progress at Gembloux is given. In variety trials, Vesce de Bourgas [Bourgas vetch] proved the most productive of the Belgian varieties tested but was inferior to a number of new Swedish and German introductions.

783 *Cantillon, P. Essais sur tabac.* (*Trials of tobacco*). (*pp. 1326–30*).

The results of variety trials are given, together with brief descriptions of the high-yielding experimental hybrids H23–1, H27–5, H27–8, H27–10 and H27–11.

784 *Derenne, P. Essais régionaux.* (*Regional trials*). (*pp. 1331–34*).

The results of trials of cereal varieties and horse beans at the Braine, Ciney and Libramont substations are presented.

(Reports on the activities of the agricultural research institutes since their establishment to the present day, prepared in conformity with a decision of the Council for Agricultural Research, May 1952).

Georgikon Deltion (Agric. Bull.)/Bull. Agric., Athens 1953 : **3** : No. 7 : Pp. 191. [Greek].

785 *Tallelis, D. E.* (*The Plant Breeding Institute at Thessaloníki*). (*pp. 1–17*).

Wheat. Xylókastron, Mínos and Erétreia are cited as among the best local varieties, and Kolónia, Rieti and Mentana as good foreign introductions. All these varieties are being replaced, however, by such high-yielding hybrids as G 38290, 42855 and 38120.

Maize. Greek and American forms are to be hybridized. Favourable results have been obtained with such American hybrids as W275, Min. 607 and W641 AA.

Potato. Selection of the variety Ella from Hungary is reported.

Rice. Local Italian and American varieties have been tested. Among the most promising varieties in respect of quality and yield were Bersani, Sedia* and Originario.

786 *Khristidis, B. G.* (*The Cotton Institute at Síndos, Thessaloníki*). (*pp. 18–41*).

Wheat. Mentana was the most productive variety tested and selections from it have been made.

Oats. High yields were obtained from strain B29 of Kassándra.

Barley. K24, a strain of Elassón, is mentioned as a high-yielding form.

Potato. Arran Banner, Majestic and Epicure were the best yielders.

Sugar beet. The best yield and highest sugar content were obtained from the introduced strain Klein Wanzleben 558–1.

Cotton. The following series of types have been studied: (1) Kh varieties, selected from the cottons grown in the Sérrai area; (2) G varieties, selected from the Khalkha cottons; (3) imported cottons; (4) D cottons obtained by intervarietal crossing; (5) the E series comprising crosses between 53D, 2G and 14Kh and selected varieties; (6) the K series of hybrids between Karnak and other varieties; and (7) triple hybrids between Asiatic and American cottons and *Gossypium hirsutum*.

Descriptions are given of the promising new varieties 2G, an early long-staple storm-proof

* ? Sesia.

type; 16Kh, a very early short-staple cotton suitable for northern Greece; and 289, which is recommended for southern Greece.
It was noted that Egyptian varieties were highly resistant to diseases.

787 *Argyroúdis, D., Stamatínis, N. & Binópoulos, X.* (*The Tobacco Research Institute at Drama*). (*pp. 42–65*).
Tobacco. Improved varieties have been obtained by selection and hybridization of local material; the following types have proved of special interest; B531, E64, Phílippoi 8, Makhalâ 7, Nigríta 34, BX 125 and 170/2/a, Sampsoûs 2 and 53, Mpasê Mpaglê 61/b, Smýrna AS68, Maûros 37 and Zíkhna Kanalíon 9. Virginia tobacco is being crossed with Greek varieties. Induction of polyploidy by means of colchicine is also being studied.

788 *Panos, D. A.* (*The Forage Crop Research Station at Larissa*). (*pp. 66–81*).
Extensive tests of Greek and introduced forage crop varieties have been made. *Lathyrus* L92, vetch Bi. 22, lentil Ph 1 and chickpea M2169 have proved superior in dry years.

789 *Dendrinos, A.* (*The State Station for Seed Testing and Control at Khalandrí*). (*pp. 82–105*).
Potato. In trials of some 80 introduced varieties Ari and Eigenheimer were placed first. Selection of Greek varieties began in 1951.
Capsicum. In trials of 14 native and foreign varieties, the following were superior: Pi-1 (selected from Kitríne), Pi–13 (from Prásine Glykeîa Mikré [Small Sweet Green]), Pi–15 (from Prásine Khondré [Fat Green] and Pi–29 (from Makroulè Kauteré [Oval Kauteré]).
Tomato. Trials of numerous Greek and introduced varieties and selections from them have shown the superiority of the following forms: T–28 (from Bonny Best), T–40 (from Antiboise), T 51 and 57 (from Athenai), T–62 (from Scarlet Globe), T98 (from Improved Pearson), and Early Chatham.
Egg plant. Out of some 600 selections under trial, the following proved best: M–3 (from Politike), M–10 (from Strongylé [Round]), M–13 (from Árgos), M 19, 22 and 36 (from Strongylè-Phoúska) and M–25 (from Argítike).
French bean. The best performance in varietal trials was by selections N 34 and 60, some North American varieties and various forms of the Mparmpoúnia type.
Pea. American dwarf varieties did best in comparative trials of native and introduced material.
Sweet corn. Varieties and hybrids from the USA have been tested.

790 *Maïmáris, G.* (*The Currant Institute at Pýrgos*). (*pp. 106–25*).
Currant. Selections with greatly increased bunch weight have been obtained.

791 **Annual Report of the Department of Agriculture, Assam 1952-53** : Pt. I : Pp. 65.
Trials were carried out on varieties and strains of cereals, sugar cane, pulses and other crops. In addition, the following work is reported:—
Rice. Selections and hybrid derivatives of different types were tested.
Cotton. Strains selected from 53 local short-staple cottons showed promise. Types cultivated in seven regions were collected during the first year of the scheme for surveying cottons in Assam (cf. *PBA*, Vol. XXIV, Abst. 1249).
***Brassica* oilseeds.** Under the project financed by the Indian Central Oil Committee, collections were made in Assam to obtain material for pure-line selection.

792 **Annual Report of the Agriculture Department of the North-West Frontier Province, July, 1949 to June, 1950** (1954) : Pp. 155 + lxviii.
In addition to variety trials of many crops, maize inbreeding for hybrid production and wheat breeding continued.

793 **Annual Report of the Department of Agriculture in the State of Bombay 1951-52** (1953) : Pp. 396.
In addition to the crops mentioned below, breeding work on maize, millet, tobacco, groundnut, flax, linseed, safflower, castor bean, milo, *Sesamum*, *Phaseolus* sp., *Dolichos*, gram and peas is described. Several varieties of potato and sweet potato have been introduced into the Bombay Province and are undergoing trials.
Wheat. Rust-resistant derivatives from Kenya E144 x Niphad 4 have been classified into red-grained and yellow-grained groups and further subdivided into early and late maturing strains. Early red-grained selections are suitable for Karnatak, while early and late maturing yellow-grained strains are adapted to Deccan and Gujarat. Two new high-yielding selections, A206 and A624, have been developed at Arnej and a number of promising experimental rust-resistant selections have been bred at Karnatak.
Rice. Breeding work in progress at Karjat, Panvel, Vadgaon, Igatpuri and Nawapur is described. Emphasis is being placed on breeding for resistance to blast. In the South Konkan

district, Kortjirgi gave the highest yields of the early varieties, and Co.25 and S1016 of the late varieties. Among other high-yielding varieties in Bombay Province were Mahadi 82 and 44, EK70, Kada 68–1, Zinia 3 and 32 and Ambemohor 59.

Cotton. Interspecific hybridization between Asiatic and American varieties has resulted in the high-yielding strains 170–Co. 2 and 66 x 22 and in the leaf-blight resistant selections 125–Co. 2–B–18 and 134–Co. 2–CW. Tests at Gujarat have shown strain 2089 to be suitable for the Surti cotton tract, where it outyields all other varieties at present grown in this district. CJ73 is superior to Pratap in yield, ginning outturn and staple length. Strain 98–41 matures a week earlier than Vijay and possesses better spinning properties (cf. *PBA*, Vol. XXIV, Abst. 3159).

794 **Administration Report of the Director of Agriculture, Ceylon, for 1951** (1952): Pp. 189; **1952** (1953) : Pp. 138.

New strains of rice, cassava, pulses and other crops were released for multiplication.

Maize. Local types are being crossed with American inbreds and Indonesian varieties. Crosses with the latter show promise with respect to several characters.

Sorghum. Hybridization is being carried out to improve grain yield and quality.

Rice. Defects such as grain shedding, weak straw, unsatisfactory milling quality and susceptibility to blast, floods and salinity, are being eliminated by appropriate crosses.

The problem of sterility in *japonica-indica* hybrids has been largely overcome by backcrossing to the *indica* parents but the progenies have given a disappointing performance.

Cotton. Individual plant selections of 5143 x Cambodia, 5143C x 5143, Co. 2, Co. 3, Co. 4, BP52, Mwanza 561 and Mwanza Local were obtained. The crosses effected included those of BP79 with most of the above-mentioned varieties and hybrids.

Cacao. High-yielding mother trees have been selected as the result of an extensive survey of the chief plantations. Pollination studies suggest that self incompatibility may be common.

Tea. Selection of mother bushes continued at the Tea Research Institute. Clones resistant to blister-blight are being tested for their reaction to *Pratylenchus pratensis*.

In its second year of plucking, clone 2024 yielded 2295 lb. of tea per acre. This clone is highly resistant to blister blight, gives a good quality tea and roots early.

Chilli. Crosses were made with the aims of (1) combining the thin-skinned character and pungency of Tuticorn with the high yield of NP41 and (2) imparting the bunchy habit of NP46 to Tuticorn.

Rubber. Tests of material bred at the Rubber Research Institute continued; hand-pollinated crosses were effected between high-yielding clones and the *Oidium*-resistant but low-yielding clone LCB870.

Lime. Putative hybrids from crosses of the indigenous lime with the Tahiti and Mindora types are under observation.

Coconut. Further work on recording the yields of selected mother palms and on testing the progenies from various crosses was carried out by the Coconut Research Institute.

Pineapple. A vigorous and apparently wilt-resistant strain has been selected from the variety Kew.

Tomato. Local strains were crossed with Greater Baltimore with a view to developing suitable F_1 hybrids. The F_1 hybrids outyielded the parents.

Annales du Service Botanique et Agronomique de Tunisie. (**Annals of the Tunisian Botanical and Agronomic Service**) 1951 : **24** : Pp. 202 + Suppl. Pp. 30.

795 *Novikof, V. A. Essais d'amélioration des variétés dans les cultures de melon et de pastèque en Tunisie.* (*Attempts at varietal improvement in the cultivation of melon and water melon in Tunisia*). (*pp. 65–100*).

The results of trials of local and introduced varieties are presented. Native material offers comparatively little scope for breeding work, with the exception of a few melon varieties such as Bèji and Galaoui, and the introduction of foreign varieties is recommended. The melons MR45, Persica 5, Turkestan, Melon d'Or d'Espagne [Golden Melon of Spain] and Honey Dew and the water melons Angelino, Chilian, Klondike Striped and Klondike R7 appear to give good results under Tunisian conditions.

796 *Maingonnat, A. Comportement et enracinement des principaux porte-greffes de vigne utilisés en Tunisie.* (*Behaviour and rooting of the principal vine stocks used in Tunisia*). (*pp. 143–202*).

The question of suitable rootstocks for Tunisian vineyards is discussed. Owing to the scant rainfall, only drought-resistant forms with a deep-rooting habit, such as 140R, R99, 1447P

and 775P, give satisfactory results. Recommendations are made as to the types of soil most suitable for each rootstock.

797 *Valdeyron, G. Rapport sur les travaux de recherche effectués en* 1952. (*Report on research projects carried out in* 1952). (*Suppl. Pp. 30*).

The results of trials of indigenous and introduced varieties of cereals, potato, fruit trees, grapes and tomato are presented. Particular attention is being paid to the development of cereal varieties resistant to smut.

798 **Annual Report on the Agricultural Department, Nigeria for the year 1951-52** (1954) : Pp. 76.

Maize. Present and future breeding programmes are discussed. The development of synthetics by Lonnquist's method (cf. *PBA*, Vol. XIX, Abst. 2546) is considered to be a more practical approach under Nigerian conditions than the production of F_1 hybrids. Inbreeding of local varieties has been initiated. Resistance to *Puccinia polysora* was given priority over all other characters in making selections of local varieties.

Pennisetum. Early-maturing inbred lines are being developed with a view to their utilization in hybrid production.

Sorghum. The main results of a survey of the types and varieties grown in Nigeria are summarized. Breeding to develop (1) varieties better adapted to the resettlement areas and (2) varieties with sweet juicy stalks was initiated by crossing the Nigerian sorghums Farafara and Short Kaura and the Gold Coast variety 9E with several American varieties. In addition to adaptability trials of many introductions, tests for resistance to diseases and pests are in progress. The development of short-strawed types suitable for mechanized farming is also receiving attention.

Cotton. Selections of 26C were tested.

Cacao. Hybrids from a cross between Nigerian and Trinidad Trinitario seedlings have given high yields of good quality cocoa. When selfed the parents showed loss of vigour.

Sesame. Selection for early and normal maturity is in progress.

Groundnut. Hybridization continued.

Cowpea. Work is being carried out on hybrids of New Era with local varieties.

799 Rapport annuel pour l'exercice 1953. (**Annual report for the financial year 1953**).
Publ. Inst. nat. agron. Cóngo belge 1954 : Pp. 507 + VII.

In addition to the crops listed below, the results of variety trials and breeding work on *Pyrethrum*, *Urena lobata*, millet, rice, sorghum, cassava, groundnut, sweet potato and citrus fruits are presented. At Yangambi, rice, coffee, groundnut and rubber plants have been treated with colchicine to obtain tetraploid forms.

Maize. Selection and testing for resistance to *Puccinia polysora*, *Sclerospora* spp. and *Helminthosporium* spp. are continuing. A number of synthetic lines have been developed.

Cotton. The results of variety trials at a number of centres in the northern regions of the Belgian Congo are given. At the Bambesa Agronomic Research Station, emphasis is being placed on breeding for resistance to *Fusarium* wilt.

Coffee. A number of new species and varieties, including *Coffea dybowskii*, *C. abeokutae*, *C. excelsa*, *C. liberica*, *C. robusta*, *C. canephora*, *C. excelsa* and *C. arnoldiana*, have been introduced into the Yangambi district from French West Africa and from Java. Crosses are being made between SA158, L36, L48, L93, L147, L215 and L251 to develop hybrids combining high yield with vigorous growth. Investigations on the percentage of self sterility and intersterility in *C. robusta* are reported. Information on the results of clonal trials at Yangambi and other centres is presented.

Oil palm. At the Yangambi Research Centre, investigations on the inheritance of the *albescens* character (cf. *PBA*, Vol. XXIV, Abst. 147) are continuing; crosses between two trees possessing the *albescens* character gave an F_1 consisting entirely of *albescens* types. Morphological and cytogenetical studies of specimens of *Elaeis melanococca* obtained from Eala suggest that at least some of these palms are hybrids between *E. melanococca* and *E. guineensis*. Cytological studies of *E. guineensis*, *E. melanococca* and *E. madagascariensis* have shown all three species to have $2n = 32$. Selection of élite trees and hybridization are being continued at Binga, Élisabetha and Bokondji.

Rubber. The results of clonal trials at Yangambi and elsewhere are presented. In trials at Yangambi, clones 24/44 and 284/69 proved comparatively resistant to brown bast; selection to improve resistance is in progress. Experiments showed that inbreeding depresses yield even in the I_1. Studies of meiosis in *Hevea brasiliensis* provided evidence in favour of the tetraploid origin of this species.

Oranges. At the Mvuazi Agronomic Research Station, some varieties, including Washington Navel, are being propagated by seed as clonal stocks have deteriorated as the result of virus

attack. Varietal differences in susceptibility to *Colletotrichum gloeosporioides* are noted. The variety Joppa has given high yields and is resistant to *Phytomonas citri.* Selection of early-maturing varieties continues.

Banana. The chromosome numbers of eight *Musa* species are given. Interspecific crosses have been carried out at Yangambi with a view to obtaining new genotypes.

Soya bean. At the Bambesa Agronomic Research Station, emphasis is being placed upon breeding for earliness and high yield. The varieties SH259/I/A, SH259/I/B, SH259/L/C/K2/3/3/2 and Palmetto are distinguished by their early maturity.

800 RATTRAY, A. G. H.
Annual Reports of Experiments of the Agricultural Experiment Station, Salisbury. Season 1952-1953.
Rhod. agric. J. 1954 : **51** : 28–44.

Maize. Strains bred in the USA and at Potchefstroom, Transvaal, and likely to be useful in the breeding programme, were seriously damaged by *Helminthosporium turcicum.* Rust (*Puccinia polysora*) was identified in Southern Rhodesia for the first time; in future it will be necessary to test inbred lines for their reaction to rust.

The hybrids tested gave a satisfactory increase in yield per acre over the open-pollinated varieties.

Velvet bean. The promising selections under test, developed with the object of increasing seed yield, are also equal or superior to the present commercial strains in hay production.

801 **Progress Report of the Dominion Experimental Farm, Brandon, Manitoba, 1948-1952** (1954) : Pp. 46.

In addition to the crops mentioned below, the results of variety trials of maize, clover, tomato, potato and soya beans are given.

Wheat. Data on yield, maturity and resistance to lodging and rust are presented for seven varieties of common and durum wheat tested during the period 1949–52. Lee, Redman and Thatcher gave the highest average yields of grain.

Oats. A new strain of Garry resistant to all Canadian races of smut and stem and crown rust and giving higher yields and possessing a greater degree of resistance to *Helminthosporium victoriae* than the original variety has been released as foundation stock. In trials conducted in 1948–52, Fortune and Exeter gave the highest average yields.

Barley. The results of variety trials conducted over the period 1945–52 are presented, together with data on maturity, length of straw and resistance to stem rust. Vantage gave the highest yields of grain, but Montcalm and OAC21 proved superior for malting purposes. Breeding for resistance to smut and rust is receiving priority; the crosses Anoidium x Montcalm, Br. 1239.11 x Anoidium and Vantage x Jet have resulted in promising disease-resistant selections. Hybrids from Br. 1136 x Montcalm and Br. 1136 x (Olli x Montcalm) have given rise to selections that compare favourably with Montcalm in malting quality and possess stronger straw and greater resistance to lodging. In an attempt to incorporate more adequate smut resistance into the malting types, back-crosses using Montcalm as the recurrent parent have been made with Anoidium.

Brome. A five-year test of northern and southern strains of brome grass, sown in pure stands and in mixture with lucerne, was completed. Nebraska and Achenbach produced the highest yields in pure stands; in mixtures with lucerne, Parkland, Lincoln, Achenbach and Fisher gave the best results. Breeding for increased yields, improved quality, greater resistance to leaf diseases and reduced creep is in progress.

Lucerne. Ladak has given the highest yields of hay in all tests conducted; Ferax and Ladak produced the highest yields of seed. Grimm was the most winter-hardy variety.

Flax. The rust-susceptible varieties Dakota and Royal are being replaced in Manitoba by the early-maturing varieties Sheyenne and Marine and the late-maturing varieties Redwood and Rocket, all of which have proved highly resistant to rust. Tabulated data on the results of variety trials conducted during 1950–52 are provided.

802 **Progress Report of the Lethbridge Experimental Station, Alberta, 1947-1952** (1954) : Pp. 51.

This account of research work at the above experiment station includes notes on progress achieved in breeding new varieties of cereals and tomato and the results of variety trials of cereals, forage crops, flax, beans, safflower, strawberry and tomato. The new hard spring wheat Chinook (cf. *PBA*, Vol. XXIII, Abst. 991) has proved highly resistant to drought and sawfly and is equal to Marquis in milling and baking properties. *Agropyron elongatum, A. intermedium* and *A. glaucum* are being crossed with *Triticum aestivum* to obtain hybrids

combining resistance to sawfly with the desirable economic characters of *T. aestivum*. Of ten varieties of lucerne tested over a two-year period, Ladak proved the most resistant to bacterial wilt.

Thirty-fourth Annual Meeting and Convention of the Agricultural Institute of Canada at MacDonald College of McGill University, Province of Quebec, June 21st to 24th.

Agric. Inst. Rev. 1954 : 9 : No. 3 : 29–40.

Horticultural section. (*pp. 31–32*).

803 *Lyall, L. H. Inherited resistance in peas to a single physiological form of* Ascochyta pisi *Lib.* (*p. 31*).

In the F_1 of the cross Ottawa A–100 x Thomas Laxton, the resistance of the former parent was dominant over the susceptibility of the latter. According to the F_2 data, duplicate factors for resistance were probably present, only one being required to give resistance.

804 *Wilner, J. A proposed quantitative test for winter hardiness of woody plants.* (*p. 31*).

Preliminary experiments have indicated that determination of the electrical conductivity of the twigs provides a satisfactory method of testing the winter hardiness of *Malus* spp.

805 *Graham, T. O. Classification of green sprouting broccoli, canning and freezing peas, and of onion varieties suitable for the production of onion powder.* (*p. 31*).

It is briefly reported that (1) sprouting broccoli varieties have been grouped according to their season, (2) peas have been classified for their suitability for canning and freezing and (3) a list of onion varieties giving a powder of good quality under conditions in Ontario has been compiled.

806 *Ste Marie, C. E. Early raspberry varieties for the Montreal region.* (*p. 32*).

Trials at the L'Assomption Experimental Station during the past ten years have shown that the varieties Tweed and Trent are outstanding as early yielders.

807 *Hunter, A. W. S. Some results of induced polyploidy in horticulture crops.* (*p.* 32).

Colchicine-induced polyploids of apple, cherry, saskatoon, asparagus, radish, spinach, tomato and ornamental species have been produced at the Central Experimental Farm, Ottawa.

808 *Aalders, L. E. The use of X-rays in apple breeding.* (*p. 32*).

See *PBA*, Vol. XXIV, Abst. 3275.

Agronomy group. (*pp. 35–40*).

809 *Larose, L. C. Varieties and strain of red clover in the Lake St. John area of Quebec.* (*p. 36*).

For several reasons late types are considered to be less satisfactory for commercial production than early forms.

810 *Dimmock, F. Soybean production and breeding in Canada.* (*p. 36*).

The achievements and aims of soya bean breeding are mentioned.

811 *Brawn, R. I. Male sterility and hybrid production of corn.* (*p.* 36).

At the Macdonald College maize breeding has been primarily concerned with introduction of cytoplasmic male sterility into established inbreds and with the evaluation of the commercial potentialities of such sterility. A line from Texas has proved to be highly satisfactory as a source of the most desirable type of male sterility in which no anthers are extruded and the tassels are dry and thin.

812 *Unrau, J. & Kuspira, J. The chromosome substitution method of wheat breeding.* (*p. 36*).

Results obtained at the University of Alberta from field trials of Chinese Spring lines with different chromosomes substituted from the donor varieties Thatcher, Timstein and Hope indicate that the substituted chromosomes have a marked influence upon both qualitative and quantitative characters. The effect of substituting specific chromosomes upon the expression of characters is similar to that of multiple alleles.

813 *McGinnis, R. C. Genome analysis of* Aegilops juvenalis. (*p. 36*).

Ae. juvenalis is concluded to carry genome D of *Ae. squarrosa* and genome C^u of *Ae. umbellulata*; the third genome was not determined. *Ae. juvenalis* contains a reciprocal translocation; one of the chromosomes involved probably belongs to genome D. The genomes of *Ae. variabilis*, C^uS^v, appear to be more closely related than their symbols imply.

814 *Plessers, A. G. Genetic studies of stem rust reaction in crosses of Lee wheat with Chinese monosomic testers.* (*p. 37*).

Lee (Hope x Timstein) possesses seedling resistance to all races of stem rust, except 15B. Its

resistance depends upon two dominant complementary genes situated on chromosome X and has been derived from Timstein.

815 *Peterson, R. F., Campbell, A. B. & Johnson, T. The breeding of Selkirk wheat.* (*p. 37*).

The breeding of Selkirk [(McMurachy x Exchange) x $Redman_3$] is described (cf. *PBA*, Vol. XXIV, Abst. 1786). The variety is resistant to race 15B of stem rust but new races, not yet prevalent, to which it is susceptible, have been collected in Canada.

816 *Dore, W. G. A native cereal species—*Zizania aquatica. (*p. 37*).

Botanical varieties of *Z. aquatica* have been compared with respect to their morphology, ecology and distribution in Canada.

817 Johnson, L. P. V.
The role of plant breeding.
Agric. Inst. Rev. 1954 : **9** : No. 6 : 11–14.

The development of rust-resistant wheat varieties, the problems encountered in breeding crops for high yield, the use of hybrids and polyploids and the relation of plant breeding to other fields of research are discussed in this popular account of breeding work in Canada.

818 DeLong, G. E.
Progress Report of the Dominion Experimental Station, Lacombe, Alberta 1947-1952 (1954) : Pp. 56.

In addition to the crops listed below, the results of variety trials of hybrid maize, swedes, mangels, lucerne, sweet and white clover, brome grass and small fruits are given.

Wheat. The principal objective of breeding has been to develop new high-yielding, early-maturing varieties suitable for cultivation in the northern districts of Alberta. In general, early maturity was found to be associated with comparatively low yields and the few hybrids combining both these desirable characters possessed inferior milling and baking properties. Crosses designed to improve the yield of Saunders without sacrificing its other desirable agronomic properties have been effected.

Oats. Crosses have been made with a view to incorporating the early maturity and good grain quality of Larain into Eagle.

Barley. Crosses among Montcalm, Olli, Sanalta and Titan were made to develop an early maturing, nonshattering variety. Of approximately 2500 hybrid lines tested, two have shown promise.

Red clover. A large number of varieties and strains were tested to determine their resistance to northern anthracnose. Dollard, Ukrainian, Ott. 1945–46 and Øtofte II proved least susceptible and selection from among these varieties has resulted in several lines with a high degree of resistance.

In variety trials, Altaswede gave the highest yields of hay.

Tomato. A breeding programme was initiated in 1949 to develop an early variety suitable for central Alberta; several selections show promise. Early Chatham gave the best results in variety trials.

819 **78th Annual Report of the Ontario Agricultural College and Experimental Farm, 1953** (1954) : Pp. 128.

In addition to the crops mentioned below, the results of variety trials and breeding work with forage grasses, lucerne, red clover and soya bean are given.

Wheat. Breeding for resistance to dwarf bunt received priority and several hundred hybrids were obtained from crosses between resistant lines from Washington and New York and suitable Ontario varieties.

Oats. Hybridization and selection were continued. Foundation stock of the new variety Simcoe was released.

Maize. A number of new inbred lines were developed, emphasis being laid upon resistance to cold.

Barley. The new fodder variety Brant (cf. *PBA*, Vol. XXIV, Abst. 2951) is giving good results. Kenate, a new winter barley developed at the Ontario Agricultural College from a Kentucky strain, is undergoing trials to determine its adaptability to different parts of Ontario. Tests at Guelph have indicated that it is more winter hardy than Wong, the winter barley most widely cultivated in Ontario.

Potato. Breeding for resistance to scab and late blight was continued. A number of varieties from the USA were tested for adaptability to Ontario conditions.

820 Memoria 1952. (**Annual report 1952**). Minist. Agric. Industr. Costa Rica 1953 : Pp. 211.

Variety tests have been carried out with potatoes, rice, sugar cane and hybrid maize; top crosses have been made with a number of maize lines to test their combining ability; and 1100 selfs have been effected in the seven best varieties.

Proceedings, abstracts of papers and addresses of the 51st Annual Convention of the Association of Southern Agricultural Workers held in Dallas, Texas, February 1, 2, 3, 1954 : Pp. 204.

821 *Chaplin, J. F. Use of tetraploid* Nicotiana tabacum *in the initial cross for transferring black-shank-resistant factor* (*s*) *from* N. plumbaginifolia *to* N. tabacum. (*p. 56*). (*Abst.*).

Valuable selections have been obtained at the Pee Dee Experiment Station, Florence, SC, by back-crossing hybrids between a colchicine-induced tetraploid of *N. tabacum* and the black-shank resistant species *N. plumbaginifolia* with susceptible flue-cured varieties. The selections resembled their back-cross parents and were highly resistant to black shank.

822 *Hanson, C. H. & Cope, W. A. Reproduction and morphology of the cleistogamous flower of perennial* Lespedeza *species.* (*p. 56*). (*Abst.*).

Self fertilization occurred in the cleistogamous flowers of the ten species examined. The flowers bore anthers but not pistils; no evidence of apomixis was obtained.

823 *Hanson, C. H. & Cope, W. A. Interspecific hybridization in* Lespedeza. (*p. 57*). (*Abst.*).

The following hybrids were obtained: *L. cuneata* x *L. latissima* and the reciprocal, *L. cuneata* x *L. inschanica, L. hedysaroides* x *L. cuneata* and *L. hedysaroides* x *L. inschanica.* All the hybrids were sufficiently self fertile to make F_2 studies possible. Stimulation of the ovary often resulted from cross pollination of annual with perennial species but the ovary usually collapsed in approximately ten days. *L. cuneata, L. latissima* and *L. hedysaroides* each had a chromosome number of $n = 10$.

824 *Jones, S. T. & Kehr, A. E. Breeding behavior of an amphidiploid shallot and its backcross progency.* (*pp. 116–17*). (*Abst.*).

The amphidiploid ($2n = 32$) obtained by colchicine treatment of the sterile F_1 hybrid *Allium ascalonicum* x *A. fistulosum* was more vigorous than the F_1 hybrid and either parent. It was evergreen, with leaves like those of *A. fistulosum,* and did not form bulbs. Plants from the back cross with *A. ascalonicum* had 8 bivalents and 8 univalents at metaphase I. The plants segregated for growth habit and other characters, indicating the occurrence of pairing and crossing-over between the chromosomes of the two species in the amphidiploid parent.

825 *Kehr, A. E. Abnormal meiosis in the Homer Red shallot.* (*p. 118*). (*Abst.*).

The Homer Red shallot ($2n = 16$), recently found near Homer, La., possesses the desirable character of erect growth but has failed as ♂ or ♀ parent in crosses with commercial varieties. Meiosis was found to be completely irregular. Several somatic chromosomes failed to pair. It is suggested that single or multiple mutations have accumulated to such an extent during vegetative propagation that sexual reproduction is now prevented.

826 *Moore, E. L. Some results with crosses of a tomato from Costa Rica and North American varieties.* (*pp. 118–19*). (*Abst.*).

At the Mississippi Agricultural Experiment Station, a tomato selected in Costa Rica for the good shape and intense red colour of its fruits failed to express its desirable features, producing malformed fruits. Its hybrids with North American varieties showed a similar behaviour. The cross between a line involving the Costa Rican introduction and an unrelated smooth-fruited selection gave rise to F_1 and F_2 plants with moderately rough fruits. In the F_3, 187 plants bore moderately rough fruits and three plants smooth fruits. Only one individual among the 400 plants raised from the smooth-fruited F_3 selections was rough-fruited. It is suggested that the behaviour of the Costa Rican tomato and its derivatives is attributable to the effect of a changed environment upon the expression of the genes concerned.

827 *Martin, J. A. & Crawford, J. H. Carolina hot pepper.* (*p. 119*). (*Abst.*).

See *PBA,* Vol. XXIV, Abst. 2335.

828 *Hawthorne, P. L. & Taylor, J. C. Louisiana Purchase, a new southern pea.* (*p. 119*). (*Abst.*).

Louisiana Purchase (Calhoun Crowder x Blackeye), a cowpea developed by the Louisiana Agricultural Experiment Station, gives high yields of peas suitable for use in the fresh, frozen, canned or dry state.

829 *Miller, J. C. Selection of desirable somatic mutations, a means of potato improvement.* (*p. 121*). (*Abst.*).

Attention is drawn to the potentialities of selecting somatic mutations, as suggested by the fact that a number of present-day varieties had their origin in this type of mutation.

830 *Parker, M. M. A new strawberry variety adapted to eastern Virginia for the production of quality berries.* (*pp. 137–38*). (*Abst.*).
Information is given on the strawberry Pocahontas (cf. *PBA*, Vol. XXIV, Abst. 2440).

831 *Smith, A. L. Resistance to* Fusarium *wilt and root-knot nematode in upland cotton varieties.* (*p. 153*). (*Abst.*).
In tests at Tallassee, Ala., H81–16 and lines of Auburn 56, involving Cook selections in their parentage, were placed first for their combined performance with respect to yield and resistance to wilt and nematode; commercial cottons such as Stonewilt, Plains and lines of Coker 100 Wilt were ranked second. Root-knot index and wilt percentage were positively correlated.

832 *Bain, D. C. Blackrot resistance in cabbage.* (*p. 155*). (*Abst.*).
Inbred selections resistant to black rot have been obtained at the Truck Crops Experiment Station, Crystal Springs, Miss., from the varieties Huguenot, Early Fuji and Round Dutch.

833 *Hunter, R. E. & Blank, L. M. Pathogenicity differences of* Xanthomonas malvacearum *isolates.* (*p. 156*). (*Abst.*).
The authors report the discovery of a naturally occurring strain of *X. malvacearum* capable of attacking breeding material possessing the bacterial-blight resistance of the Stoneville–20 type.

834 *Richmond, T. R. Recurrent selection in a three-species cotton hybrid.* (*pp. 173–74*). (*Abst.*).
Recurrent selection, with the main aim of high fibre strength, has been successfully applied to the triple hybrid between the colchicine-induced amphidiploid of *Gossypium thurberi* x *G. arboreum* and *G. hirsutum* at the Texas Agricultural Experiment Station. During four cycles of intercrossing of lines with high fibre strength, each followed by selfing and selection for strength and good agronomic characters, the average strength remained consistently high and at the same time considerable genetic variability in other characters was maintained. When fibre strength was the only objective of selection, it was possible to produce one population with a progeny mean higher than the mean of the parental material and another population with a lower mean. The range of variation in the selected progenies exceeded that of the parent population in both the high and low direction.

835 *Lewis, C. F. Unusual combinations of fiber properties from a 3-species cotton hybrid.* (*pp. 174–75*). (*Abst.*).
It is expected that promising strains with combinations of fibre properties not ordinarily found in commercial varieties will be developed at the Texas Agricultural Experiment Station from a triple hybrid involving "an Asiatic cultivated cotton, a wild shrub of Arizona and cultivated Upland cotton."

836 *Davis, J. H. Potentialities of the Upland cotton collection at Stoneville, Mississippi.* (*p. 175*). (*Abst.*).
A brief account of the Upland-cotton collection maintained at the Delta Branch Experiment Station is given.

837 *Meyer, J. R. A single gene for smoothness transferred from* G. armourianum *to American Upland cotton.* (*pp. 175–76*). (*Abst.*).
A type of glabrousness derived from *Gossypium armourianum* and designated D_2 in accordance with the genome of this species has been found to be determined by a partially dominant gene at the Mississippi Agricultural Experiment Station. This type of glabrousness affects the whole plant and may be valuable in solving the trash and lint-cleaning problems involved in mechanized harvesting.

838 *Lund, Z. F. Smooth leaf breeding in Upland cotton.* (*p. 176*). (*Abst.*).
The strain Delta Smooth Leaf has yielded 10–25% less trash than commercial varieties; further breeding is, however, necessary to improve the strain with respect to other properties. Its glabrousness, derived from a selection of DPL11A, depends upon several genes; use is now being made of the monogenically determined D_2 type of glabrousness.

839 *Moosberg, C. A. New coarse cottons.* (*pp. 176–77*). (*Abst.*).
Breeding is in progress at the Cotton Branch Station, Marianna, Ark., to develop varieties with coarser and stronger fibre more suitable for modern methods of harvesting and ginning. Crosses of the coarse-fibred variety Rowden with Deltapine 15, Acala strains, Bacterial Blight Resistant 3 and Empire WR have yielded promising lines combining coarseness and other desirable characters. A strong, coarse-fibred strain from Nucala x Rowden lacking some of the requisite economic properties has been crossed with a selection of (Acala x Hopi) x Acala possessing very strong, medium-fine

fibre; material from this cross has given good results in harvesting and ginning tests.

840 *Stafford, T. J. & Henderson, M. T. Inheritance of strength of fiber in a cross between two varieties of American Upland cotton.* (*p. 177*). (*Abst.*).

Inheritance of fibre strength was studied in two crosses between Wilds and Half and Half. Weak fibre was partially dominant. In one cross, the parents probably differed by four pairs of genes affecting strength, each pair contributing approximately 0·5 of a Pressley index unit. In the second cross, the parents apparently differed by two pairs of factors, each pair being responsible for 0·7 of a unit. Heritability of fibre strength in the two F_2 populations was 65% and 63%, respectively (cf. *PBA*, Vol. XXIV, Abst. 3160).

841 *Thaxton, E. L.* (*Jun.*). *Varietal response to defoliation in the high plains of Texas.* (*p. 179*). (*Abst.*).

Marked varietal differences in response to chemical defoliation have been observed at the Texas Agricultural Experiment Station. Genetic constitution is among the factors influencing susceptibility to defoliation.

842 *Hall, W. C. & Bird, L. S. Response of varieties of cotton to chemical defoliation.* (*pp. 179–80*). (*Abst.*).

In tests in Texas during 1953, varieties exhibited differences in response to defoliants at a given centre but the same varieties did not defoliate similarly at the different places. Maturity and bacterial-blight reaction did not affect defoliation.

843 *Green, J. M. & Brinkerhoff, L. A. Breeding blight resistant cotton.* (*p. 180*). (*Abst.*).

Two methods have been used at the Oklahoma Agricultural Experiment Station: (1) transference of the bacterial-blight resistance of Stoneville 20 to Stoneville 62 by back-crossing, and (2) selection for resistance within varieties. Method (2) has required only four years, compared with the eight years entailed in (1), and according to preliminary tests has given more promising strains.

844 *Ware, J. O., Waddle, B. A. & Young, V. H. A survey of Upland cottons with respect to degree of susceptibility to* Verticillium *wilt.* (*pp. 180–81*).

In tests of 600 varieties and lines in north-eastern Arkansas, a number of entries were significantly less susceptible to *Verticillium* wilt than the fairly resistant control, Deltapine 15. Consistent exceptions to the general correlation found between boll number and wilt percentage should make possible the breeding of tolerant or resistant lines.

845 *Peebles, R. H. Current status of American-Egyptian cotton breeding.* (*p. 196*). (*Abst.*).

The older varieties of American Egyptian cotton showed improvements only in yielding ability and spinning quality. Besides giving higher yields, the new variety Pima S–1 is improved with respect to boll size and lint percentage; in spinning qualities it is equal or superior to Pima 32 (cf. *PBA*, Vol. XXIV, Abst. 478).

846 **Sixty-fourth Annual Report of the South Carolina Experiment Station of Clemson Agricultural College, for the year ended June 30, 1951** (1952) : Pp. 147.

Wheat. The new unnamed variety Y2375 (Trumbull x Frondosa), a soft wheat with high yielding ability, rust resistance and good quality, is to be multiplied. The leaf rust resistant strain Y2652 (Leapland x Fronteira) has been released on a small scale under the provisional name of Anderson (cf. *PBA*, Vol. XXII, Abst. 1806).

Cotton. Breeding is being carried out to incorporate high spinning performance in both short and long-staple cottons, the noncommercial lines Hopi Acala from California and "Triple Hybrid" from North Carolina being used as sources of high fibre quality in crosses with EH Long Staple, Sealand, Coker 100 Wilt, Empire and Early Fluff.

Pear. In an epidemic of fire blight and leaf spot during 1951 in the coastal area, Baldwin, Keiffer and PI49494 exhibited resistance to both diseases.

Cabbage. Progress has been made in developing (1) an early round-headed spring type by crossing Round Dutch with a round-headed Wakefield selection and (2) a late, cold-tolerant variety of the winter type by crossing heading collard with cabbage.

Water melon. The lines 48–12 and 48–13 have shown a high degree of resistance to *Fusarium* wilt.

Summer squash. Hybrid forms of Cocozelle and Zucchini have not shown sufficient superiority over the ordinary varieties to justify the extra cost of F_1 seed production.

Cucumber. Introductions from Turkey and India with downy-mildew and anthracnose resistance but ripening very late and possessing black spines have been crossed with lines resistant to mildew and of commercial standard;

promising lines resistant to both diseases have been selected. Puerto Rican varieties with unsatisfactory fruit type but resistant to mosaic and mildew have also been crossed with commercially desirable mildew-resistant lines. The combination of resistance to all three diseases is planned.

Cowpea. PI115681 (*Vigna sesquipedalis*) has been used as a source of resistance to powdery mildew in breeding edible cowpeas; mildew-resistant lines will be crossed with the *Fusarium*-wilt resistant variety Calhoun Crowder.

847 Burr, W. W. & Adams, J. C.
50 years of research at the North Platte Experiment Station.
Circ. Neb. agric. Exp. Sta. 1954 : No. 93 : Pp. 32.

This report includes a brief popular account of work at the North Platte Experiment Station, Neb., in breeding and testing varieties of cereals and leguminous crops suitable for cultivation in the western arid regions of the state.

Boerger, A. (Editor)
Actas y trabajos del Primer Congreso Sudamericano de Investigadores en Materias Agronómicas. (**Report and proceedings of the First South-american Congress on Agronomic Research**).
Arch. fitotéc. Urug. 1953 : **5** : 282–420.

The report of Section IV (Animal Production) of this congress appeared in *Archivo Fitotécnico del Uruguay* Vol. 5, No. 2 (cf. *PBA*, Vol. XXIII, Abst. 375). The papers in Section III (Plant Production), Subsection I are presented in Vol. 5 No. 3; the following items are of interest to plant breeders.

848 *Guimaraes, F. F. & Torres, C. B. Produção de variedades sintetizadas en cebola* (Allium cepa *L.*). [*Production of synthetic varieties of onion* (A. cepa *L.*)]. (*pp. 297–309*).

Observations made on 90 onion varieties from different parts of the world showed almost all the varieties introduced from elsewhere to be unsuitable for growing in Rio Grande do Sul. A large number of local lines have therefore been subjected to selfing. Deleterious effects on vigour, flowering and seed germination began to be evident in the third and fourth generations of selfing. Data are presented showing the bulb types obtained in the fourth selfed generation of some typical varieties. Groups of bulbs belonging to several promising selfed lines were planted together under large muslin cages or in spatial isolation, flies of the genus *Calliphora* being introduced into the cages at the time of flowering. In this way 22 synthetic varieties have been constituted; the first were formed from a group of S_2 or S_3 lines from the same variety; they were superior to the original variety in uniformity of form and colour of bulbs and in freedom from rotting during storage and have all given satisfactory yields. Other synthetics involving lines from disease-resistant types are in course of observation.

849 *Guimaraes, F. F. Trabalhos de melhoramento em batata americana* (Solanum tuberosum *L.*). [*Work on breeding potato* (S. tuberosum *L.*)]. (*pp. 311–43*).

No imported potato has proved really suitable for growing in southern Brazil; some 330 of them have been tested and are listed. Selfed seed was taken from some of those which had the highest degree of self fertility; the largest amount of seed from selfing was furnished by the varieties Lichtblick, A–28–4–S and Cuculus. No set at all was obtained in hybridizations when the flowers were bagged, but without bagging sets of up to 14% were attained. The best pollen varieties were A–13–6, Cuculus, Earlaine, Katahdin and 96–56. In addition to crosses within *S. tuberosum*, crosses were made with *S. chacoense*, *S. demissum*, *S. commersonii*, *S. millanii* and certain unclassified species from Argentina and Mexico. The cross *S. demissum* x *S. tuberosum* was quite successful and the seedlings have been backcrossed with *S. tuberosum*; only two seedlings were obtained from *S. tuberosum* x *S. commersonii* and none at all from all the other interspecific combinations.

Some of the hybrids so far obtained are promising in yield and resistance to virus and *Phytophthora infestans*; the best in these respects are seedlings from the variety 96–56 and one selfed seedling of Stärkeragis; some of the seedlings of *S. demissum* x Katahdin are also promising; seedling X–194–1 from Konsuragis x Sd. 12–559 combined resistance to *Ph. infestans* and virus and several seedlings combined resistance to *Ph. infestans* and *Alternaria solani*.

850 *Klein, E. 35 años de trabajos de cruzamientos de combinación en trigo.* (*35 years of work on combination crossing in wheat*). (*pp. 345–72*).

The writer gives an outline of his work on wheat breeding, started in 1912 in Uruguay and continued from 1919 onwards in Argentina. Selection was always started in the F_2. The result has been a long series of improved varieties, descriptions of which are presented,

starting with Klein Record, released in 1925; it was a hybrid between two Argentine wheats, Americano 25 and Americano 26n. Cross IX (Barleta 7d x Americano 44d) gave rise to Klein Vencedor [Victor], Sin Rival [Unrivalled], Ceres and Titán, the last-named being recommended as a parent for breeding varieties resistant to *Puccinia triticina*; Vencedor and Sin Rival have figured in the parentage of 24 of the most successful Argentine varieties. In 1923 the Italian variety Ardito was used in crosses and introduced properties such as earliness, strong short straw, resistance to *P. glumarum* and higher yielding capacity. In 1924 a further advance was made with the use of 38MA, a hybrid of Barleta with a Chinese wheat immune from *P. triticina*, leading to the production of Klein 40, 47 and 66.

Attempts to breed high quality wheats of the hard-red spring class date from 1934, when Klein Sinmarq (Sin Rival 15300 x Marquis) was distributed; this was followed by a series of Marquis derivatives; other hard wheats of high quality were obtained from crosses with Barleta 23 (= Lin Calel MA), one of the best of which was Klein Progreso [Progress] which has gone out of cultivation only owing to its susceptibility to *P. glumarum*. Klein 157 (Hope x Lin Calel) is resistant to rusts and to *Septoria nodorum* and the first of the author's varieties to be inscribed in the official variety register. The next was Klein Éxito, described as early, resistant to *P. glumarum*, *P. triticina*, *P. graminis*, *Ustilago tritici*, lodging and shedding and giving a Brabender farinograph figure of 72. Klein Alberti is an early variety, also resistant to the three rust species, *U. tritici*, lodging and drought and has grain of the semihard type, with a Brabender figure of 70. Klein Cometa [Comet] is resistant to frost, drought, shedding, *U. tritici* and the three rust species, with good grain giving a Brabender figure of 72; this variety was recommended for all the wheat-growing areas of Argentina in 1949. Klein Orgullo [Pride] is resistant to shedding, lodging, frost and *U. tritici* and fairly resistant to the three rust species; it has yielded 3730 kg. of grain per ha. with a Brabender figure of 73. Klein Aniversario [Anniversary], a derivative of Reliance x Klein 75, is the earliest of the varieties at present recommended, being at the same time resistant to the main races of *P. triticina* and *P. graminis*, to *U. tritici* and to frost, drought and shedding; it has outyielded other varieties of the same maturity date by 17% and has a Brabender figure of 86. Klein Cóndor combines high yield and quality with resistance to the three rust species, frost, drought, lodging and shedding and is recommended for the whole of the Argentine wheat zone; it has a Brabender figure of 79. Klein Lucero [Morning Star], a hybrid of Klein Progreso x Apulia, is inscribed provisionally on the strength of its very high and regular yields, resistance to all three rust species and to other diseases, lodging, shedding and drought; it exceeds all other Argentine varieties as a blending wheat, having a Brabender figure of 93. A diagram shows the interrelationships and parentage of these wheats, all of which are descended from a basic group of 18 varieties, 9 of them of local origin and the other 9 introduced; the latter group includes Ardito, Reliance, Marquis and Apulia.

851 *Ribeiro, R. Evolución varietal del trigo en el Uruguay.* (*Varietal evolution of wheat in Uruguay*). (*pp. 373–91*).

The course of wheat breeding operations in Uruguay is outlined from the start made by Boerger in 1912 to the present day. Pedigree selection of the local wheats led to rapid improvement whereas almost all foreign introductions were a failure. Crossing the local selections with one another led to further improvements in the form of varieties such as Artigas and Larrañaga, which went out of cultivation only after the appearance of *Puccinia glumarum* in 1929; the resistant varieties Centenario [Centenary], Porvenir [Future] and Renacimiento [Renaissance], released in 1931, were superseded on grounds of yield, quality, adaptability and resistance to both *P. glumarum* and *Ustilago tritici* by the Litoral group and certain Argentine varieties such as Klein Cometa, Pelón Plateado and Petiso; the only European variety that has done well is Rieti. The severe attacks of *P. triticina*, often combined with *P. graminis*, that began in 1944 caused attention to be turned to the Brazilian wheats Rio Negro and Frontana and the more recent hybrids of the La Estanzuela breeding station, such as Petirrojo and Petiblanco, which entirely replaced the varieties grown previously, with the exception of Klein Cometa and Litoral Precoz [Early Littoral]. Tests over the period 1943–48 showed that Rio Negro, Petirrojo and Frontana were superior to other varieties in years of both high and low rust attack. The difference in their favour was more pronounced in the years when rust was most severe, when the average yield of these three varieties was 11·8 q. per ha. and that of the susceptible varieties 7·3 q.; in rust-free years the resistant varieties yielded 17·0 q. per ha. and the susceptible 15·5 q. Petiblanco was

introduced into the tests only in 1947 and has proved better than Petirrojo and statistically not inferior to Rio Negro. Newer lines from the crosses DP (Rio Negro x Litoral Precoz) and DQ (Klein 157 x Litoral Precoz) have proved still more promising; one of them, DQ3(150)², was significantly better than all others at the 5% level and all but Rio Negro at the 1% level. An analysis of the biotypes of the rust populations indicated that the severe attacks of *P. triticina* in 1944 and succeeding years were due to an increased frequency of races 5 and 15, while from 1947 onwards races 20, 49, 114 and 105 became more prevalent. In *P. graminis* the main races are 17 and 15. Although the new varieties are resistant to these rust races they have the defect of being susceptible to *Ustilago* and Petiblanco also shows a tendency to shedding; their reaction to *P. glumarum* is unknown, since this rust has not been present in Uruguay in recent years. In the hope of avoiding possible disasters in the future a mixed population comprising more than 100 lines selected from the F_3 of various crosses is being grown with the minimum of selection, to provide as rich a source as possible of gene potentialities for meeting any possible change in the parasite populations that may occur in future years.

852 *Viegas, G. P. A produção de híbridos de milho em São Paulo.* (*The production of maize hybrids in São Paulo*). (*p. 403*). (*Abst.*).

Among some 4000 hybrids studied at the Campinas station in Brazil, the double cross IA3531 proved outstanding, yielding 18% more than the variety Catêto.

853 *Lysholm, M. V. Resultados de los trabajos con maíz híbrido en el Instituto Fitotécnico de Santa Catalina.* (*Results of work with hybrid maize in the Santa Catalina Plant Breeding Institute*). (*p. 403*). (*Abst.*).

Yield increases of up to 33% over the commonly grown variety Early Evergreen have been obtained from hybrids in sweet corn; increases of 25–26% over Colorado Klein are reported for dent hybrids and 29% for hybrids between flint and dent types. Some early-maturing flint hybrids have outyielded Long White Flint by 12%.

854 *Saez, F. A. Una técnica para el estudio de los cromosomas somáticos largos en los vegetales.* (*A technique for studying long somatic chromosomes in plants*). (*pp. 403–04*). (*Abst.*).

A method of making permanent squash preparations from cut sections of Liliaceous roots such as those of *Brodiaea, Allium* and *Nothoscordum* is described.

855 *Tomé, G. A. Obtención de una variedad de alfalfa resistente al nemátode del tallo.* (*Production of a lucerne variety resistant to stem nematode*). (*p. 404*). (*Abst.*).

A lucerne resistant to *Ditylenchus dipsaci* has been obtained by mass selection at the Agronomy and Veterinary Faculty, Buenos Aires.

856 *Saez, F. A. La citogenética del sorgo negro* (Sorghum almun) *y el problema de su origen.* [*Cytogenetics of black sorghum* (S. almum) *and the problem of its origin*]. (*pp. 404–05*). (*Abst.*).

The Argentine grass known as black sorghum or black Sudan (cf. *PBA*, Vol. XIV, Abst. 869) has a somatic chromosome number of 40 and several multivalents have been observed at meiosis. The hypothesis of its hybrid origin (cf. *PBA*, Vol. XV, Abst. 639) is supported by the fact that a plant in every way similar to it has been produced by Randolph at Cornell by chromosome duplication of a hybrid of *S. halepense* x *S. sudanense*, and has been classified by Parodi as *S. almum* var. *randolphianum* (cf. *PBA*, Vol. XVI, Abst. 1753).

857 *Rigoni, V. A. & Krapovickas, A. Observaciones sobre herencia de color en la testa de maní* (Arachis hypogaea *L.*). [*Observations on inheritance of colour in the testa of groundnut* (A. hypogaea *L.*)]. (*p. 406*). (*Abst.*).

When the pink-seeded variety Guaycurú was crossed with various other varieties with pink seeds certain forms with red seeds appeared in the F_2 and F_3. The existence of more than one gene for pink testa in this variety was confirmed in crosses with varieties having white or mauve testa.

A local runner variety from Bolivia is mentioned as genetically interesting since its habit proved only partially dominant, in constrast to the majority of runner forms which are dominant.

858 *Krapovickas, A. & Rigoni, V. A. Cromosomas de una especie silvestre de* Arachis. (*Chromosomes of a wild species of* Arachis). (*p. 406*). (*Abst.*).

A. villosa var. *correntina* has $2n = 20$ and its chromosomes show constrictions similar to those in *A. hypogaea*. Hybrids between the two species have $2n = 30$.

Hybrids between *A. hypogaea* and *A. marginata* have also been produced.

859 *Rosbaco, U. F. Maices amargos.* (*Bitter maize*). (*pp. 406–07*). (*Abst.*).

In the F_2 of crosses of the Amargo [Bitter]

maize, resistant to locusts and to corn borer, with susceptible varieties a proportion of 1·6 susceptible to 1 resistant was observed. In crosses of Amargo x dent no resistant dent types appeared. The juice of the Amargo maizes turns red with H_2SO_4, that from the local susceptibles turns less red; the American hybrid maizes, whose juice also turns red with H_2SO_4, are however not much more resistant than are local susceptibles.

A double-cross Amargo hybrid is now ready for the market and work is in progress to produce resistant synthetics by combining Amargo with dents from N. America. Crosses of Amargo with *Euchlaena mexicana* have been made with the object of producing a resistant teosinte for forage.

860 *Lázaro, R. C., Navarro, G. & Alaggia, H. A. Comunicación sobre heterosis en cruzamientos "intertipo".* (*Communication on heterosis in "intertype" crosses*). (*p. 407*). (*Abst.*).

No difference in heterosis was observed between crosses of the type flint x dent and dent x dent.

861 *Kugler, W. F., Marciotte, C. & Davreux, M. Nuevas variedades de lino tipo intermedio obtenidas.* (*New varieties of intermediate-type flax obtained.*) (*pp. 407–08*). (*Abst.*).

Hybrid H28–1–0–0–2–2–5 produced at the Pergamino station in Argentina is a good dual-purpose form suitable for both fibre and oil production and resistant to wilt and rust. H131–1–3–3–5–3 yields only 5% less seed than the linseed 330MA and equals Mapún MA in fibre production.

The quality of the fibre in both varieties is somewhat inferior to that of true linen flaxes.

862 *Kugler, W. F., Marciotte, C. V. & Davreux, M. Progresos en el mejoramiento del lino textil realizados en Pergamino.* (*Progress in breeding fibre flax at Pergamino*). (*pp. 408–09*). (*Abst.*).

The first flax varieties produced at the Pergamino station in Argentina were Mapún MA, a selection from Russian material, and Achay MA, from Polish; the latter had a higher fibre yield and was resistant to the two main races of flax rust, the former was more resistant to wilt. Hybrid H100–1–12–3–6–3–2 is more wilt-resistant still and is immune to rust races 19–22. By back crossing it with Mapún MA, a completely rust-resistant form of that variety has now been produced. Hybrid H185 combines very high wilt resistance with resistance to all the main races of rust.

863 *Abalo, R. A. Primer híbrido doble de maíz, tipo duro, obtenido en Pergamino.* (*The first double-cross hybrid of flint maize obtained at Pergamino*). (*pp. 409–10*). (*Abst.*).

The four lines that figure in the parentage of the flint hybrid Santa Fe 3 are described.

864 *Pujals, E. A. Problemas de fertilidad y germinación en cruzamientos de papa.* (*Problems of fertility and germination in potato crosses*). (*p. 410*). (*Abst.*).

The set of seed was much improved in the Argentine province of Santa Fe when the plants were grown in the greenhouse and given supplementary light from fluorescent bulbs.

865 *Zunino, H. Porcentaje de cruzamiento libre en el cultivo algodonero.* (*Percentage of free pollination in the cotton crop*). (*p. 411*). (*Abst.*).

In the presidency of Roque Saenz Peña in Argentina the amount of cross pollination was 8–10%. Crossing occurred occasionally at a distance of up to 50 m., insects being the pollinating agents.

866 *Oliveira Paiva, B. Observações sobre melhoramento de trigo.* (*Observations on wheat breeding*). (*p. 411*). (*Abst.*).

In general, Brazilian varieties are more resistant to scorching on acid soils than are imported wheats but Petiblanco from Uruguay is an exception. The phenomenon seems to be related to a deficiency of Ca and P in the soil; resistance to it is dominant but genetic ratios are complex.

867 *Kugler, W. F., Godoy, E., Marciotte, C. & Bruni, O. Fuentes de resistencia a* Melampsora lini (*Pers.*) *Lev.* [*Sources of resistance to* M. lini (*Pers.*) *Lev.*]. (*pp. 411–12*). (*Abst.*).

The resistance gene of Bombay CI42 behaves as a simple dominant and has been transferred to the varieties Charrúa MA, H8–2–10–2–1–1–1 and others; they are not however resistant to race 41, resistance to which occurs, together with the Bombay factor, in hybrid H87bF6–2. Hybrid 10678–3 is immune from all the Argentine rust races and in spite of being susceptible to *Fusarium lini* it will be used in crossing; it apparently contains two genes, one giving moderate resistance to race 41 and the other complete immunity to race 22.

Among the linseeds, selection 13927/45 possesses resistance to races 19, 22, 40 and 42 in Argentina and has been shown in the USA to be highly resistant to race 41; it is, however, very susceptible to wilt.

868 *Kugler, W. F., Marciotte, C. & Davreux, M. El marchitamiento y el lino oleaginoso; su influencia en el rendimiento.* (*Wilt and linseed; its influence on yield*). (*pp. 412–13*). (*Abst.*).

The varieties most resistant to *Fusarium lini* are Charrúa and H8–2–10–1–1, in which a yield reduction of 10% was observed, as against 50% in Querandí and 70% in Klein 11.

869 Síntesis Memoria Anual años 1948–1951. (**Summary of the annual report for the years 1948-51**).
Rev. industr. agríc. Tucumán 1948–52 : **38** : 57–90.

The work reported includes varietal tests with cotton, sugar cane, maize, lucerne and a number of other crops, the selection of the form Tucumana of the pepper Ruby King, resistant to virus disease, and chickpeas resistant to yellowing caused by *Fusarium* sp. and *Alternaria* sp.

870 Memoria año 1952. Dirección General de Fomento Agrícola. (**Annual report for 1952 of the Director General of Agricultural Improvement**).
Bol. Prod. Fom. agríc., B. Aires 1953 : **5** : No. 43–48 : 1–184.

Details are given of the new varieties of various crop plants which have been entered in the official register, either provisionally or definitively, of variety tests that have been made with a wide range of plants, and of the work of seed production and certification. Breeding operations reported on include the following.

Cotton. Some 43% of the total area under cotton is now sown with local selections and this proportion is continually increasing; the most popular selection is Las Breñas 341, followed by Las Breñas 16 and Sáenz Peña 61.

Capsicum. Lines selected from crosses between the sweet pepper Perfección 1MA and the chilli Largo de Chile [Chile Long] have exceeded the local standard Bolita Salteño by 41·8%, are more healthy and give a higher proportion of first-class fruits.

Oil plants. Crosses have been made between Argentine linseeds and varieties of the Brazilian 38 group, which are dwarf and early.

Selection has been carried out in sesame for resistance to *Fusarium sesami*, *Alternaria* sp. and *Cercospora sesami*, and for reduced branching, nondehiscence, number of capsules and number of carpels; some of the new lines have outyielded the common sesame by 200%.

Guayule. In the first generation, selection is performed according to thickness of cortex; from the second generation chemical analysis is applied. Selections with up to 19% of rubber have been obtained.

Groundnut. Some lines selected from hybrid material obtained from the USA have exceeded the local standards Santa Fe and Córdoba by up to 100% in yield; selection 947–DCE–011 is also superior in earliness, oil content and yield and quality of forage. Two selections from the white variety Santa Fe have exceeded the parent variety in yield of grain and forage, and in oil content and earliness. Attention has also been given to resistance to *Cercospora personata*.

Soya bean. Lines have been selected from the variety Abura which combine earliness and freedom from shedding with good yield.

871 Reunión técnica en el Centro Regional Andino. (**Technical meeting at the Regional Andean Centre**).
Idia 1954 : No. 79 : 7–12.

The results reported on at this meeting of Argentine agricultural research workers included seedlings of vine rootstocks selected for resistance to eelworm, a number of direct-producer hybrids, a synthetic onion variety with reduced tendency to bolting, an early-maturing selection of Sioux tomato with exceptionally high yield, and polyploids of the Sioux, Platense and San Marzano tomatoes.

872 Progreso realizado en las investigaciones agrícolas durante el año 1953. (**Progress attained in agricultural research in the year 1953**).
Idia 1954 : Nos. 73–74–75 : Pp. 159.

The work reported on by the plant pathology section includes the study of a number of cereal varieties and their reaction to smuts. The wheats Sinvalocho MA and 38 MA proved immune to loose smut and a number of varieties from abroad showed resistance. Race 4 of *Puccinia graminis* var. *avenae* is spreading in Argentina, the variety Garry and related oats being recommended as sources of resistance to it. The best wheats for breeding for resistance to races 11, 15 and 17 of *P. graminis* var. *tritici* were Kenya 338 AC1a2, Kenya 338 AC2e2, Kenya 117A, Egypt NA101, Tremez Molle and Beladi [Local]. In an F_2 of (*Triticum durum* x *Agropyron*) x Sinvalocho, 42 biennial plants were obtained. Observations have been made on the reaction of a collection of over 300 oat varieties to *Heterosporium avenae* and of over 1300 wheats to *Septoria nodorum*; new races of *Rhyncosporium secalis* capable of attacking the barley varieties RM85, Winter Forage and Trebi, and also various wild species,

have been produced by culturing for a number of years on the wild species. Mutants of *Ustilago zeae* have been induced by treatment with formaldehyde. Sugar-cane varieties have shown differences in their resistance to *U. scitaminea*. A new gene for resistance to *Erysiphe graminis* has been found in wheat and been designated *M1*[a]. By crossing the wheats Reliance and Linea G [Line G], lines have been isolated which are resistant to the four main Argentine races of *Puccinia graminis* and to *P. triticina*, though they are susceptible to *Septoria nodorum*. Observations are being made on the adaptation of *Bacillus subtilis* to streptomycin. Resistance to net blotch in *Hordeum spontaneum* and the variety Rojo [Red] is dominant in inheritance. A collection of sorghums resistant to *Helminthosporium turcicum* is being built up; also sorghums resistant to *Pseudomonas andropogoni*, *Xanthomonas holcicola*, *Ps. syringae* and *Colletotrichum graminicolum* and barleys resistant to *Puccinia anomala*. Two genes for resistance to *X. translucens* have been found in Kindred barley.

In the genetics section, crosses of *Hordeum leporinum* (tetraploid) x *H. murinum* (diploid) have shown the two species to have one genome in common; hybrids have been obtained also from *Agropyron scabrifolium* x *H. hexaploidum*. Improved varieties of *Sorghum almum* have been produced and selection of nonrhizomatous forms is continuing. Improved selections have been made of other forage plants including *Phalaris minor*, *Sanguisorba minor*, *Helianthus tuberosus*, *Trifolium incarnatum*, *Festuca arundinacea*, *Agropyron scabrifolium*, *T. pratense* and lucerne; forage barleys have been selected from the cross *H. vulgare* 'Osiris' x *H. spontaneum* and ryes from the common rye x Waldstauden rye. Studies of the effect of the cytoplasm in inheritance have shown that in maize it can affect heterosis, the viability of the microgametophyte, the size of grains and ears and the time of maturity. A number of characters in *Hordeum spontaneum* have been shown to be allelic to characters in *H. vulgare*. Interspecific crosses have been made with *Beta vulgaris*, *B. maritima* and *B. patellaris*. Allopolyploids of *Phalaris tuberosa* x *Ph. arundinacea* are distinguished by great vigour, and self-sterile clones of both species are being used in back crosses in the attempt to produce vigorous commercial hybrids. A natural hybrid of *Ph. tuberosus* x *Ph. minor* is being studied. Selection is being performed in tobacco for industrial quality and mosaic resistance.

The vegetable section reports the selection of white cabbages superior in earliness, yield and quality and carrots free from bolting; the bean Idaho Refugee, resistant to anthracnose, has been crossed with a number of other varieties. Various pea crosses have been selected for yield, earliness, quality and resistance to frost and diseases, peppers have been selected which are early, productive and resistant to *Fusarium* and bacterial diseases, and squashes have been selected for earliness, hardiness, yield and size and uniformity of fruit.

The biochemistry section has analysed the gluten properties in a number of wheat crosses; there is a tendency for the durum qualities to be dominant to those of soft wheat.

The work of plant collection has been continued and interesting material of coffee, tea, sugar beet, cassava, grape vines and many other plants has been introduced.

The activities of the section of agricultural botany include botanical studies of a number of Argentine plants, including the genus *Prunus*, the species *Ilex paraguariensis* and the hybrid willows; these have proved to be triploid, with $2n = 57$, and are thought to have originated by hybridization between the local *Salix humboldtiana*, a diploid, and some tetraploid willows such as *S. alba* var. *calva* or *S. babylonica*. Intraspecific crosses have been made between a number of *Salix* species; also between the following: *Elymus glaucus*, *E. patagonicus*, *Agropyron scabrifolium*, *A. agroelymoides*, *A. scabriglume* and others; meiosis has been studied in *A. scabriglume* and in a new hexaploid species of *Agropyron* from Jujuy. Chromosome counts have been made in *Ephedra* spp. and various other plants, including *Linum selaginoide*.

The microbiology section reports on selection of strains of *Rhizobium* of increased virulence and efficiency in nitrogen fixation, of *Aspergillus niger* for citric acid production, other *Aspergillus* spp. for production of antibiotics, and of wine yeasts for resistance to SO_2 and to alcohol.

Reports on the activities of each of the regional experimental stations are presented, from which the main items of interest are the following.

Wheat. Several hybrids derived from G–1–1–115–1–1 are mentioned as distinguished by yield, disease resistance and quality at the Pergamino station. A number of varietal crosses and a large collection of varieties are also under observation; Klein 32 remains the one with the strongest straw. Studies were made of the biotypes of *Puccinia graminis* var. *tritici*, *P. rubigo-vera* var. *tritici*, *Septoria nodorum* and *S. tritici*. Hybrid H188–0–0–0–1–0 and Klein Cometa are indicated as resistant to race

15B of *P. graminis* var. *tritici* and certain hybrids proved resistant to this race and to races 15 and 20 of *P. rubigo-vera* var. *tritici*. Several hybrids showed resistance to *S. nodorum* but none to *S. tritici*.

A number of hybrids are mentioned as being outstanding in milling and baking quality, determined by the use of the Bühler experimental mill.

At the Manfredi station selections of (Thatcher x Sinvalocho) x Beckman 2018 and (Thatcher x Sinvalocho) x Beckman 1971 have proved resistant to stem, leaf and yellow rust, and at the Rafaela station too some hybrids of Thatcher x Sinvalocho have proved free from *P. graminis* and *P. triticina*. A hybrid of Thatcher x Sinvalocho has shown itself outstanding in resistance to *S. nodorum* and *Tilletia* sp. at Tezanos Pinto, where offspring from (Med.-Hope x Kawv.-Tenmarq) x Klein Cometa have displayed excellent disease resistance.

A hybrid from Alto de Sierra 04 x La Estanzuela 3250 x Rafaela 6L3 has been named Presidente Perón MAG.

The Balcarce station reports a number of durum wheats of good industrial quality, including selection (BL x P x M) x (Roca 5649), which stands up well to grazing.

Varietal differences in reaction to 2,4D were observed at Oliveros.

Triticum x *Agropyron* hybrids received as perennial wheats have behaved as annuals with the exception of a few plants.

Oats. Among a number of varieties of *Avena byzantina* and *A. sativa* observed at Pergamino under very unfavourable growing conditions, Buck 20 (*A. byzantina*) proved the best. At Manfredi, Klein Mar was highest in rust resistance and Buck 152 in yield. Buenos Aires 107 gave particularly high yields at Rafaela. Selections of oats combining high yield of fodder and grain with freedom from shedding have been made at the Cañadón León station.

Rye. Selections resistant to drought and *Puccinia rubigo-vera* have been made at Manfredi; Waldstauden rye showed resistance to drought. Selection for resistance to *P. anomala* and *Rhynchosporium secalis* has been carried out at the Oliveros station.

Experiments at the General Pico station have shown that selections of Pico rye can be grazed after 50–60 days whereas ryes introduced from Poland require 100 days before they reach this stage. Pico rye also beat all others in grain production at the General Pico and Eva Perón stations.

Maize. The Pergamino station has extended its programme of crossing inbred lines and is including certain dent inbreds from the USA for crossing into the local flint hybrids. Resistance to root rot is being studied as well as combining ability and resistance to lodging and borer; experiments are being made with male-sterile lines for the production of commercial seed. Comparisons of hybrids with open-pollinated varieties showed yield differences of 10–40% in favour of the hybrids FAV 355, Pergamino 2 and Lucila 503; the flint and semident hybrids were less attacked by borer, smut and *Fusarium* than the dent hybrids, which however were more lodging resistant.

At the Oliveros station the hybrids yielded 18% more than the varieties, the best hybrid being Pergamino 2 which produced 2116 kg. of grain per ha.

Efforts are being made at the Manfredi station to produce early hybrids of maize resistant to drought. At Rafaela the best hybrids were Pergamino 2 (flint) and FAV355 (semident), which yielded over 20 q. per ha., whilst the best yield from open-pollinated varieties was 14 q. Promising drought-resistant double-cross hybrids are reported also from the Balcarce station.

Genetic studies at Tezanos Pinto show that the gene conditioning the bitter character in Amargo [Bitter] maizes does not give straightforward monohybrid ratios in the F_2. Further selections are being made for locust resistance in Amargo maize and a locust-resistant synthetic, Amarga 1, has been produced. Studies are being made on the inheritance of grain consistency in crosses of dent x flint types.

Barley. At Manfredi the varieties Guatraché Araucana and Negra Manfredi [Manfredi Black] proved very drought resistant and at Rafaela the best forage yields were given by Guatraché Araucana and FAV 19; the latter was outstanding also at other stations and gave indications of being resistant to *Puccinia anomala*. At the General Pico station Guatraché Araucana gave the highest grain yields, the best yields of fodder being given by two selections of Negra barley.

Several selections of malting barley were distinguished by low protein content at the Eva Perón station, where other selections are recorded as giving high yields of fodder and being resistant to grazing. The highest yields of both forage and grain were given by the hybrid (Primor x Trebi FCS) x Massaux EM699/50.

Selections of *Hordeum coeleste* combining yield, earliness, resistance to *Ustilago hordei* and

freedom from shedding have been made at the Cañadón León station.

The forage barley Negra Manfredi MAG, which is resistant to green aphids, has been crossed with varieties resistant to mildew and scorching. Promising lines possessed of resistance to *Rhyncosporium* sp. have been selected at Bordenave from the hybrid (Primor x Trebi) x Massaux.

Sorghum. The variety Early Kalo showed the greatest resistance to *Diatraea* spp. at Manfredi. At Oliveros the sweet sorghum S222–8–14 has outyielded Leoti Red Kafir and other sweet sorghums by a wide margin and is also distinguished by drought resistance and good tillering capacity and lower toxicity. Selections of Imperial Kafir at the Eva Perón station are inferior in grain yield and earliness. Selection of *Sorghum almum* for absence of rhizomes has continued at Pergamino; selections C–4 and A–33 have exceeded the standards in forage yield by 25% and contain only about 30% of plants with rhizomes as compared with 82 in the common forms. Selections E12 and Magnif 504 have also given good results. Selections free from rhizomes have been made also at Manfredi and with reduced rhizome development at the General Pico station.

Strains of Sudan grass low in durrhin content have been selected at the Rafaela station and at Oliveros line 4203 has proved excellent in yield, vigour and forage quality.

Selections of the sorghum variety Rancher were outstanding for their earliness and forage characteristics at the Eva Perón station.

Forage plants. At Pergamino, selections have been made from old fields of lucerne and the 35 best plants used to build up a strain which has suffered less root rot and other diseases than have the strains grown previously. At Manfredi, selection for self sterility is being performed, with a view to producing lines suitable for making hybrids, and at Mendoza selection for resistance to stem nematode. Hybrids of *Medicago sativa* x *M. falcata* show very vigorous development and cold resistance at Cañadón León.

Two selections of *Bromus catharticus* have been made at Pergamino, Pergamino PF195 being superior in early development and seed production, and Pergamino PF172 in tillering and leafiness. These two varieties receive the most favourable comment from the Rafaela station too.

Other plants of which selections have been made at Pergamino include *Phalaris minor, Ph. tuberosa, Lolium multiflorum, L. perenne* and *Dactylis glomerata*, and a number of other species have been examined as possible sources of fodder. Selection PF1372 of *L. perenne* from Pergamino gave excellent results at Rafaela and some promising selections of *D. glomerata* are mentioned. Very promising results were given by *Eragrostis curvula* and *Melilotus officinalis* in respect of cold and drought resistance and fodder production at the General Pico station, where selections of *Panicum miliaceum* and *Setaria italica* have also given promising yields of fodder and grain. Selections of *Agropyron cristatum* have been made at the Eva Perón station, where selection has been carried out also with *Elymus junceus* and *Triticum* x *Agropyron* hybrids.

Chromosome counts in wild leguminous species are given as follows: *Zornia* $2n = 20$; *Aeschynomene* $2n = 20$, *Desmodium* $2n = 20$, *Eriosema* $2n = 22$, *Lathyrus* $2n = 14$, *Vicia* $2n = 14$, and *Indigofera* $2n = 16$.

Potato. In 1952–53, 229 different crosses were made at the Balcarce station, the best pollen parents being found to be the varieties Huincul MAG, Selecta Balcarce 13, 528–170 and B746–4, and the best seed parents Selecta Balcarce 13, Essex, B733–39 and B821–22. Certain specially favourable crosses are indicated. Seedlings of Huincul MAG both from selfing and crossing have been selected for resistance to scab and *Fusarium* and for tuber type.

Cotton. A programme of intervarietal and interspecific hybridization has been started in order to introduce improved lint quality into the Argentine cottons. Three American and 12 Asiatic wild species have shown resistance to *Fusarium* wilt and certain other diseases, together with strong fibre. Several selections are mentioned as possessing wilt resistance at Roque Sáenz Peña.

Lines C. Mascías 6769 and 72097 have distinguished themselves at Colonia Mascías in both yield and quality. At Las Breñas, selection 341 was characterized by high lint percentage, and Sáenz Peña 61 and Las Breñas 16 by good yields. Several selections from Juntalgodón Brebbia and from crosses of it with imported varieties are mentioned as combining good yield and lint quality at the La Banda station, Juntalgodón Brebbia 83 and 72 being outstanding here and elsewhere.

Flax. A rust-resistant form of the variety Calchaquí has been produced at the Pergamino station; it is also resistant to wilt, and exceeds the parent variety in fibre yield. A rust-resistant back cross of hybrid H588 with Achay is also distinguished by resistance to wilt, pasmo

and lodging and by fine, soft fibre. Two other rust-resistant varieties are mentioned, Mapún 52 MAG and Mocoví MAG, the latter being also resistant to wilt.

Hemp. Mass selection S/46–000 has exceeded the local populations by 70% in stem yield and 3% in fibre percentage at Pergamino; some of the individual plant selections have given better results still.

Sugar cane. Seedlings obtained from Colombia have yielded almost 90 tons per ha. and given purity indices from 77° to 86°. Observations are being made on various Tucumán seedlings and on resistance to *Ustilago scitaminea.*

Tobacco. Selections of Kentucky tobacco made at the Cerro Azul station continue to show superiority to the local unselected tobaccos in both yield and commercial quality. Selection 725 of Criollo Especial has also outyielded the local population.

Pepper. Lines superior in disease resistance, yield and quality have been selected in both paprika and cayenne types.

Oil plants. At the Pergamino station, observations on the progenies of 68 crosses involving 18 superior parent varieties and selections showed line aH684 F5–15 to be outstanding in yield, resistance to lodging, pasmo, wilt and rust. Selection towards a dual-purpose type has been made in the variety Ranquel, which arose by multiplication of an F_1 plant of a cross. The new variety Tezanos Pinto Entrerriano has greatly outyielded Querandí in conditions of heavy lodging. Charrúa MA has remained free from rust. At the Oliveros station a new variety Oliveros Toba MAG has been registered and several selections are mentioned as combining resistance to wilt, pasmo and lodging with high yielding capacity.

In tests made at Pergamino with 29 single-cross hybrids some of them gave yields three times that of Klein, the variety used as standard; all were late-maturing types and had a higher oil content but also higher husk percentage than Klein.

At the Manfredi station *Helianthus argophyllus* has proved susceptible to rust but some resistant plants have appeared in crosses of it with *H. annuus*; also in hybrids of *H. cucumerifolius* x *H. annuus*.

Synthetic varieties have been produced at Tezanos Pinto by crossing inbred lines.

A number of selections of *Carthamus tinctorius* were examined at Pergamino; although the spineless selection N–514–2–10–1 from Nebraska was the best it was still inferior to linseed and sunflower in yield.

Fruit trees. Observations of varieties were carried out on apples, pears, plums, peaches, almonds and a number of other fruits.

Varietal studies of vines are in progress at a number of stations, and at Mendoza observations on a number of direct-producer hybrids showed Seibel 7053 and Bacol to be capable of producing good wine.

Notes are given on the most frost-resistant varieties of orange, lemon, mandarin, grapefruit and their rootstocks and on the best varieties as regards yield and fruit quality.

Improved clones of the mandarin Común de Concordia [Concordia Common] have been selected at the Concordia station.

Several varieties of avocado displayed a certain degree of cold resistance at Manfredi.

Groundnut. Hybrids derived from the variety Overo Boliviano, which is resistant to *Cercospora* spp., root rot, virus diseases and sprouting, are being selected for earlier maturity and for smooth pods to which the soil does not adhere.

Fertile hybrids have been obtained between *Arachis hypogaea* and a species formerly classed as *A. pusilla.* The hybrid has $2n = 40$ as in both parents. Selections of both erect and creeping forms have shown superiority to Blanco Manfredi [Manfredi White] at Manfredi.

Vegetables. Crosses have been made between the pumpkin and the squash, both belonging to *Cucurbita moschata.*

Three improved lines of the Valencia onion, all superior in bulb characteristics and freedom from bolting, have been produced by the Mendoza station.

Some tomato selections made at Manfredi are distinguished by resistance to virus diseases.

Two strains of *Lycopersicum* virus 3 have been detected, and tomato varieties varied in their reaction to them in the field.

Selections of the Sioux tomato with improved leaf production are reported from the Mendoza station.

873 **Twenty-eighth Annual Report of the Department of Scientific and Industrial Research, New Zealand :** 1954 : Pp. 68.

The section entitled Research, giving a general account of some of the main results of work during the year under review, includes the following items of interest to breeders:—

Wheat. A high-yielding line showing promise as a possible substitute for Dreadnought is to be released for commercial trial in south Canterbury and north Otago. It ripens two weeks earlier than Dreadnought, has not

shattered or lodged and is suitable for direct heading.

Oats. Milford (S225), bred at the Aberystwyth Plant Breeding Station, Wales, is to be released on account of its stronger straw and greater resistance to lodging than other varieties of milling oats.

Cocksfoot. A new strain derived from plants of New Zealand origin is much more productive than C23; it is now being grown for the production of pedigree certified seed.

Tobacco. High yielding lines resistant to black root-rot have been developed; their smoking quality has to be determined.

Other projects on the genetics, breeding and testing of crops are listed under the Crop Research Division and other appropriate Divisions.

874 **Fifth Annual Report of the Commonwealth Scientific and Industrial Research Organization for the year ending 30th June, 1953 : Canberra, Australia :** Pp. 191.

Pasture species. An extensive collection of grasses and legumes from the Mediterranean region and from Africa is under investigation. An analysis of intervarietal and intravarietal differences is expected to elucidate the origin and subsequent evolution of Australian forms. Study of the performance of the varieties and strains in relation to environmental conditions in Australia and in the places of collection is also expected to provide comparative climatological data likely to be valuable in plant introduction.

Fertile perennial allopolyploids of *Phalaris tuberosa-Ph. minor* ($2n = 56$) and *Ph. caerulescens-Ph. minor* ($2n = 42$) have been induced by treating the F_1 hybrids with colchicine.

The hard-seeded condition in *Trifolium subterraneum* is partly genetically conditioned. Some varieties, e.g. Dwalganup and Northam First Early, consistently produce a high percentage of hard seed; F_2 progenies from crosses between these two varieties gave significantly greater proportions of hard seed than crosses such as Tallarook x Mount Barker. Tallarook, the standard variety in the coastal areas of New South Wales, often produces most of its growth and sets its seed too late in the season. By crossing it with Dwalganup and Northam First Early, earlier F_2 segregates have been obtained. Varieties such as Dwalganup, Northam First Early and Pink-flowered display a lethal reaction to a virus within the group bean mosaic II but apparently possess some field resistance. The inheritance of the lethal reaction is being studied.

Chromosome-doubling in *T. subterraneum* is associated with a considerable increase in susceptibility to mosaic. Only in the case of Dwalganup did the tetraploids exceed the diploids in dry-matter production by the end of the season. Seed production was reduced in the tetraploids but not to such an extent as to preclude their use.

Some chromosome-doubled lines of *T. repens* show superiority over the ordinary form in vigour and ability to withstand adverse conditions; they produce good seed yields and are low in cyanogenic activity. Doubled lines of *Medicago tribuloides* merit further testing.

Potato. The leaf-roll resistance of Bismark depends upon a virus-inactivating system (cf. *PBA*, Vol. XXIV, Abst. 439). Crosses have been effected to combine this type of resistance with resistance to viruses X and Y and to late blight.

Flax. Work on the development of disease-resistant varieties continued.

Tobacco. Selfed progenies of hybrids carrying the necrotic type of resistance to mosaic are under test. At temperatures above 75° F this type of resistance breaks down. One variety has exhibited resistance to the looper caterpillar (*Plusia* spp.); crosses have been made to determine whether this character is inherited.

Linseed. Yield trials of Walsh x Punjab lines are in progress; some of the lines are superior to Walsh in yield and oil quality and combine the rust resistance of both parents. Investigations on the degree of cross pollination were completed.

Safflower. Selection has resulted in high-yielding strains, some of which have shown a 28–40% increase in oil content in comparative trials with unimproved varieties. Intervarietal crosses have been made for studying the inheritance of several characters.

Tomato. The spotted-wilt resistance of Rey de los Tempranos [King of the Earlies] is being incorporated in commercial-type hybrids possessing resistance to *Fusarium* wilt and nematode. The spotted-wilt resistance of this variety is expressed by the ability to produce healthy shoots if infected and is apparently recessive.

The F_1 hybrids SA Dwarf Red (C strain) x Vetomold and Tatinter x Vetomold are suitable for greenhouse cultivation and combine high yields, leaf-mould resistance and other desirable features.

875 **Report of the Institute of Agriculture of the University of Western Australia for the period 1949-53** : Pp. 68.

In Part III the following investigations are reported:—

Wheat. Variety and locality had equally marked effects upon thiamin and protein content; a highly significant positive correlation between thiamin and protein content was found within each variety (cf. *PBA*, Vol. XXII, Abst. 268).

Subterranean clover. Breeding has been undertaken to develop strains showing improvements particularly in earliness of maturity, seed yield, capacity to set seed above ground and vigorous winter growth.

A technique of embryo culture was adopted to overcome the problems of dormancy and the hard-seeded condition.

Hybrid strains with mid-season maturity and aerial seed setting have been developed, the latter character being derived from the variety Burnerang. These strains have a high stem : leaf ratio. Besides their immediate value, they are useful for crossing with introductions from Morocco, which have large leaves and vigorous growth in winter but a low leaf : stem ratio. Early-maturing commercial types combining the required characters are expected from the crosses of an erect strain of Yarloop x Burnerang with Morocco, Dwalganup and early hybrid selections.

The inheritance of several qualitative characters has been studied, e.g. red anthocyanin pigmentation in the variety Red Leaf and linkage between flower colour and leaf crescent in Bacchus March x Pink Flower. The failure of crosses of Palestine with standard varieties is probably due to chromosomal differences. The strains Palestine and Israel each have 12 large somatic chromosomes, which bear no apparent relationship with the 16 fairly small chromosomes distinguishing the standard types; in caryotype these two exceptional strains resemble *Vicia sativa*.

Pollen germinated equally well in self and cross pollinations. For at least three-quarters of the length of the style no marked inhibition of pollen-tube growth could be detected. The amount of seed set varied according to the female parent. Other factors under investigation in relation to seed set include mechanical damage to flowers during artificial crossing, humidity, temperature and burial of burrs.

Swainsona. Except for the doubtful case of *S. canescens* ($2n = 24$), the species examined all had $2n = 32$. To facilitate investigations on interspecific fertility a technique of injecting pollen suspensions prior to anthesis was devised for pollinating the cleistogamous flowers characteristic of this genus.

Kennedya. The following species were found to have $2n = 22$ chromosomes and to be caryomorphologically similar: *K. prostrata, K. nigricans, K. prorepens, K. carinata, K. stirlingii, K. coccinea, K. beckxiniana* and *K. rubicunda.* The species are self-fertilizing; interspecific and intraspecific crosses have so far failed to give viable seed.

Atriplex* and *Kochia. The possibility of utilizing hybrid vigour resulting from crosses between inbreds is to be investigated.

The eight annual species of *Atriplex* examined all had $n = 9$. No viable seed was obtained from 42 interspecific crosses.

Tomato. The genetics of resistance to strains of spotted wilt virus has been investigated (cf. *PBA*, Vol. XXIII, Abst. 1569 and Vol. XXIV, Abst. 738). The commercial potentialities of F_1 hybrids have also been studied (cf. *PBA*, Vol. XXII, Abst. 1537).

876 **Biennial Report of the Hawaii Agricultural Experiment Station, 1950-1952** (1953) : Pp. 74.

Indigofera. An attempt is being made to develop a nontoxic type of *I. endecaphylla* by interspecific crossing.

Sweet potato. The new variety Onolena (Porto Rico x Nancy Hall) combines the table and keeping qualities of Porto Rico with superior yielding capacity and general adaptation to Hawaiian conditions.

Macadamia. The early-bearing, high-yielding, disease-resistant and hardy varieties Wailua and Ikaiki have been released.

Papaya. Four inbred lines of the Solo type have been developed; each possesses some of the chief characteristics desired in commercial varieties.

Cauliflower. The recently released cauliflower Pua Kea was selected from the Early Market variety of Indian cauliflower; unlike other varieties of *Brassica oleracea* it can withstand the hot weather of Hawaii.

Lettuce. The variety Kaala (Manoa x Great Lakes) has been released; it heads well, is resistant to tipburn and retains much of the good quality of Manoa.

Tomato. The nematode-resistant F_1 hybrid between Lanai and a derivative of Molakai has been named Kalohi. It derived its nematode resistance from the latter parent, which obtained its resistance from the wild Peruvian tomato.

877 MATTHIAS, W.
Über ein papierchromatographisches Verfahren für Serienuntersuchungen in der Pflanzenzüchtung. (**On a paper-chromatographic procedure for serial examinations in plant breeding**).
Züchter 1954 : **24** : 313–16.
The method described is advocated as a means of testing new varieties for their aminoacid, organic acid, sugar, oil and vitamin contents.

878 CICIN, N. V.
(**Distant hybridization of plants**).
Priroda (Nature), Leningrad 1954 : No. 1 : 21–34. [Russian].
This paper is substantially the same as that previously summarized in *PBA*, Vol. XXIV, Abst. 2774.

879 HÄNSEL, H.
Methoden und Erfolge der Strahlen-Mutations-Züchtung bei Kulturpflanzen. (**Methods and results of breeding by inducing mutations by irradiation in crop plants**).
Bodenkultur 1953 : **7** : 354–62.
This popular account of methods by which mutations may be induced includes information on the maximum doses of irradiation tolerated by various plant species and descriptions of valuable mutations induced in cereals by irradiation.

880 HARDAS, M. W. & JOSHI, A. B.
A note on the chromosome numbers of some plants.
Indian J. Genet. 1954 : **14** : 47–49.
Chromosome numbers are reported for 17 wild and cultivated species growing at the Indian Agricultural Research Institute, New Delhi, or in its neighbourhood; it is believed that the numbers are reported for the first time. The species examined include: *Pueraria hirsuta* and *P. phaseoloides*, $2n = 22$; *Priotropis cytisoides*, $n = 8$; *Mucuna cochinchinensis*, $n = 11$; *Luffa echinata*, $n = 13$; *Abelmoschus ficulneus*, $n = 36$; *Carthamus caeruleus*, $2n = 24$; and *Agropyron desertorum*, $2n = 28$.

881 GARDÉ, A. & MALHEIROS-GARDÉ, N.
Contribuição para o estudo cariológico de algumas espécies de angiospérmicas. I. (**Contribution towards the caryological study of some species of angiosperms. I.**).
Genet. iber. 1953 : **5** : 115–24.
The chromosome numbers reported include *Avena filifolia*, $n = 7$; *A. sulcata*, $2n = 16$, *Bromus lanceolatus*, $2n = 28$, *Asparagus scandens*, $n = 10$, *A. umbellatus*, $2n = 20$, *Medicago cretacea* and *M. durieni*, $2n = 32$, and *Galega officinalis*, *G. orientalis* and *G. patula*, $2n = 16$.

882 HORBER, E.
Die Züchtung insektenresistenter Feldgewächse in den USA und Kanada. (**Breeding crop plants resistant to insects in the USA and Canada**).
Landw. Jb. Schweiz. 1954 : **3** : 369–93.
After a brief introductory account of the physiological basis of resistance to insect pests the author surveys breeding work at present in progress on cereals, forage plants, potato, cotton and sugar cane in the USA and Canada, with special emphasis on the activities of the Kansas Agricultural Experiment Station.

CEREALS

883 Rassenlijst voor landbouwgewassen 1955. (**Variety list of agricultural plants 1955**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1954 : **11** : p. 49.
Brief data on the yield, quality of grain and straw, maturity, resistance to disease, soil requirements and degree of winter hardiness are presented for the winter wheats Carsten VI, Leda and Cappelle Desprez and the winter barleys Trias and Atlas. Particulars of the breeders and seed producers of these varieties, which are included in the official Netherlands list of approved varieties for 1955, are also given.

884 OPITZ, K.
Wie steht es mit der weiteren Erhöhung der deutschen Getreideernten durch Züchtung und Sortenwahl? (**What are the chances of further increasing German cereal yields by breeding and varietal selection ?**)
Z. Pflanzenz. 1954 : **33** : 209–15.
The principle of the law of diminishing returns is applied to breeding for increased yields in cereals. Evidence, based on a study of West German authorized varieties over the period 1947–52 is put forward to support the hypothesis that, whereas further yield increases may be obtained in the case of winter and spring wheat and winter barley, the possibilities of achieving further increases in the yields of oats, spring barley and winter rye are remote. It is emphasized, however, that breeding for other factors, such as greater resistance to diseases,

lodging, shattering and drought, may result in an increase in the actual amount of grain harvested.

885 Meyer, K.
Zur Frage der weiteren Erhöhung der deutschen Getreideernten durch Züchtung und Sortenwahl. (**On the question of further increasing the German cereal harvests by breeding and varietal selection**).
Z. Pflanzenz. 1954 : **33** : 424–26.
Data compiled from studies conducted at Grabau and other experiment stations in Germany are presented to support the view that there are no valid reasons for assuming that any limits which may exist to breeding for increased yields in cereals have yet been reached (cf. Abst. 884).

886 Reeves, J. T.
Oats and barley in Western Australia.
J. Agric. W. Aust. 1954 : **3** : 453–61.
The results of recent yield trials of oat and barley varieties are summarized, the varieties under trial being briefly described. Varietal recommendations are made for the different districts of Western Australia. Of the new oat hybrids tested, W29 [Ballidu x M59 (Mulga x Laggan)] is expected to be released at the end of the 1954–55 season, on account of its high yielding capacity and other desirable agronomic characters.

887 Thomas, I. & Reeves, J.
New cereal varieties in Australia.
J. Agric. W. Aust. 1954 : **3** : p. 510.
The following varieties, recently registered in Australia, are described: the wheat Sherpa (cf. *PBA*, Vol. XXIV, Abst. 2791); the oats Acacia (cf. *PBA*, Vol. XXIII, Abst. 1021) and Bovah (cf. Abst. 255) and the flax Ventnor. The last-named variety was selected at the Waite Agricultural Research Institute, SA, from [(Saginaw x Ottawa) CI687 x Norfolk Earl] x Norfolk Earl. It is resistant to the South Australian races of *Melampsora lini* and has small, partly dehiscent and easily threshing capsules. It matures its seed at the same time as Liral Crown and is equal to this variety in both fibre yield and grade.

888 Morrison, J. W.
The place of cytology in cereal breeding.
Agric. Inst. Rev. 1954 : **9** : No. 3 : 17–19, 66.
The author provides a short popular account of the use of cytology in cereal breeding, referring to interspecific and intergeneric hybridization, chromosome doubling, classification of mutants, aneuploidy, and the possible mutagenic effect of chemicals employed in agricultural production.

889 Peters, R.
Vorselektion induzierter autopolyploider Gersten- und Roggenkeimlinge nach der Wurzeldicke. (**Preselection of induced autotetraploid barley and rye seedlings according to the thickness of the root**).
Züchter 1954 : **24** : 128–31.
The germinating seed of tetraploid forms of rye and barley obtained by colchicine treatment and temperature shocks at the Institute of Plant Breeding of the University of Halle-Wittenberg, Germany, had radicles approximately 1 mm. thicker than the $2n$ control. It is suggested that the visual inspection of germinating seeds offers a rapid and effective method of distinguishing tetraploids from diploids at an early stage. Cytological examination showed some of the barley seedlings to be chimeras with both $4n$ and $2n$ cells present in the radicle.

890 Bhaduri, P. N. & Ghosh, P. N.
Chromosome squashes in cereals.
Stain Tech. 1954 : **29** : 269–76.
Highly satisfactory squash preparations of the chromosomes of wheat, *Aegilops*, *Agropyron*, rye and barley have been obtained by prefixation treatment of the root tips with α-bromonaphthalene solution and by using a fixative containing 8-oxyquinoline, chromic acid and osmic acid, before staining with leucobasic fuchsin. In order to remove the fatty particles caused by this treatment, the root tips should be washed in dilute sulphuric acid and the dehydrated tissue should be cleared in turpentine.

891 Liszenko [Lysenko], T. D.
A tavasziak átalakítása őszieké. (**Transforming spring cereals into winter cereals**).
Agrártudomány 1952 : **4** : 297–300.
An account in Hungarian is given of the author's method of transforming spring cereals into winter forms by means of vernalization.

892 Zonjić, I.
(**A study of the dormancy period in seed**).
God. poljoprivred Fak./Yearb. Fac. Agric., Beograd 1952 : No. 4 : 169–86. [Serbian].
At Zemun, the dormant grain of some cereal varieties germinated after being kept at 12° C

for several days. In the case of oats and barley, germination was speeded up by removing the glumes and pricking the seed coat of wheat and rye grains with a needle. Some evidence in support of Nilsson-Ehle's thesis that red-grained varieties germinate less readily and at a slower rate than others had been obtained.

893 SANDFÆR, J.
Virkningen af det naturlige udvalg ved forædlingsarbejdet med selvbefrugtende kornarter. (**The influence of natural selection on breeding work with self-fertilized cereal species**).
Tidsskr. Planteavl 1954 : **58** : 333–54.

The closely-related barley varieties Maja, Freja, Carlsberg II and Binder were used. Mixtures of two varieties in equal proportion were grown and the individual varietal yields compared with the yields of the same varieties grown in pure stands. In all mixtures involving Freja, this variety outdid the other component, the order of competitive ability of all four varieties being Freja > Carlsberg II ≥ Maja > Binder.
Similar work with three oat varieties gave the corresponding series Stål [Steel] > Borris Opus II > Lyngby Hede.

894 WIENHUES, F.
Fortschritte in der Züchtung auf Winterhärte bei Weizen und Gerste. (**Progress in breeding for winter hardiness in wheat and barley**).
Z. Pflanzenz. 1954 : **33** : 437–58.

The results of observations made in January and February, 1954 at the Max Planck Institute for Breeding Research, Voldagsen, Germany, on the degree of winter hardiness of European and North American wheat varieties are reported, special attention being paid to the inheritance and physiological basis of frost resistance. The Swedish varieties Svea and Ergo, the Russian varieties Karschov 287, Krasnyĭ Kut 0527, Timirjazev 2453 and 2671 and Vjatka 5, the Finnish varieties Pohjola and Jokioinen L08409, the American varieties Marmin x H44 x Minhardi 2768, Minter 2713 and Minturki 1507 and the German varieties Zapfs Neu [Zapf's New], Carsten VIII, Criewener 192, Peragis and Salzmünder Standard displayed a high degree of winter hardiness. Studies of experimental crosses indicated that winter hardiness was dominant and polymerically determined. It was easily transferred from one variety to another and the suggestion is made that the exceptional winter hardiness of certain hybrids may be due to the cumulative effect of a number of additive genes giving rise to a form of heterosis in as far as winter hardiness is concerned. Crosses effected with a view to combining early maturity with winter hardiness proved highly successful, especially in Hauter II x strain 9089/41 (Rotbart [Redbeard] x Ritter [Knight] x Minhardi) and strain 8835 x Peragis. Crosses between mildew-resistant spring barleys and early-maturing, winter-hardy forms gave high-yielding hybrids combining the favourable characters of both parents.

895 HOBBY
Där man sår ogräs och förfryser höstrapsen. (**Where weeds are sown and autumn rape is frozen**).
Lantmannen, Stockholm 1954 : **38** : 843–46.

This popular account of research in progress at the Institute for Plant Cultivation at the Swedish Agricultural College contains the following information of interest to plant breeders.
Results are expected next spring on the reaction of different cereals and different varieties of various cereals (1) when left standing in the field, awaiting combine harvesting and (2) as regards breakage of ear and straw when threshing is proceeding.
In collaboration with N. O. Johansson of the National Institute of Phytopathology, a method of freezing plants under natural conditions in the field by means of a specially constructed freezing-box is being tried: (1) to test the regeneration capacity of plants after cold injury of varying severity; and (2) to compare the cold resistance as determined by freezing in the field and by freezing harvested plants in the laboratory.

896 TOKIMASA, F.
(**Studies on the damage caused by excessive moisture to cereals. II. Interspecific and intervarietal differences in respect of damage caused by excessive moisture**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 266–67. [Japanese].

Information is given on the heading period, height, ear length, number of ears, weight and number of grains per plant, and 1000-grain weight of a series of Japanese varieties of wheat and common and naked barley when grown under (1) normal and (2) excessively damp soil conditions. Considerable intervarietal differences in response to excessive soil moisture were noted.

WHEAT

897 Wagner, S. & Popow, G.
Die wichtigsten Weizensorten des schweizerischen Richtsortimentes für den Getreidebau 1954. (**The more important wheat varieties of the Swiss official assortment for cereal cultivation 1954**).
Mitt. schweiz. Landw. Zürich-Oerlikon 1954 : **2** : 125–32.

Information on the pedigree, morphological characteristics, yielding capacity, quality of grain and soil requirements of the winter varieties Probus, Mont-Calme 245 and Mont-Calme 268 and the spring varieties Huron and Lichti's Weihenstephaner früher Sommerweizen [Lichti's Weihenstephan early spring wheat] is presented.

898 Valdeyron, G.
Enseignements techniques à tirer de la campagne de céréales 1953–54 en Tunisie. (**Technical lessons to be drawn from the 1953-54 cereal season in Tunisia**).
Tunis. agric. 1954 : **55** : 97–113.

Data are included on the yielding capacity, disease resistance and baking quality of the principal wheat varieties grown in Tunisia. An account of new varieties recently introduced from France is also given.

899 De Carolis, V.
Adunque, lo liquidiamo, il Damiano? (**So we are to do away with Damiano, are we ?**).
G. Agric. Domen. 1954 : **64** : p. 361.

It is pointed out that the wheat Damiano has failed to give good yields only in years such as 1953–54 where sowing conditions in northern Italy were unfavourable and that no other variety is yet available which could adequately replace Damiano.

900 Gurčenko, V. S. & Markova, A. A.
(**Best varieties of winter wheat for the Nonchernozem Zone**).
Zemledelie (Agriculture) 1954 : No. 10 : 95–101. [Russian].

Varieties surpassing the existing standards in yield, hardiness, grain quality and resistance to lodging and diseases are listed. Some of them, e.g. Cicin's hybrids 1, 186 and 599, have been developed in recent years. Others, such as Vysokolitovskaja [Tall Lithuanian] and local forms of Sandomirka, are established land varieties.

901 Praksin, S.
(**Sowing winter wheats in the spring**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1954 : No. 12 : 40–41. [Russian].

In the Nonchernozem Belt, some winter wheats were sown in spring instead of autumn to obtain green matter the first year and grain the second. Of the varieties tested, Lutescens 9 and Pšeničnо-Pyreĭnyĭ Gibrid 186 [Wheat-*Agropyron* Hybrid 186] proved the most productive, the latter yielding 26·7–24·4 c. grain and 141–189 c. green matter per ha. The plants used in this experiment formed stronger roots, set more grain and produced longer ears than when sown in autumn.

902 Ponomarčuk, M. K.
(**An important reserve for increasing yields**).
Zemledelie (Agriculture) 1954 : No. 11 : 68–74. [Russian].

The cultivation of new high-yielding cereal varieties and the application of modern cultural practices are advocated. A new spring wheat has been bred at Tulun and surpasses Lutescens 62 in yield and earliness. A productive new maize population from Krasnodar, obtained from the mixed sowing of four interline hybrids to facilitate their cross pollination, is also mentioned.

903 Shindo, S.
(**On the breeding of the hard spring wheats Karafuto 2 and Karafuto 3 for southern Sakhalin**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 156–57. [Japanese].

Karafuto 2 [Sakhalin 2], a selection from Italian Spring x Garnet Ottawa 452, outyields Garnet in southern Sakhalin. Karafuto 3 (Italian Spring x Reward Ottawa 928) is three days later than Karafuto 2 but bears larger grains. These varieties were bred during the Japanese suzerainty of southern Sakhalin and are stated not to be available now in Japan.

904 Karišnev, P. B.
(**Biological importance of variability in wheat varieties**).
Agrobiologija (Agrobiology) 1954 : No. 4 : 35–40. [Russian].

The utilization of variability in breeding is discussed, with special reference to the varieties Novinka [Novelty], Moskovka [Moscow], Hordeiforme 27, Preston and Gorickaja. The first two varieties give a segregating progeny when crossed with other varieties. Some hardy material was selected from the cross Novinka x

Triticum sphaerococcum var. *rotundatum* and forms notable for productive tillering and long ears were obtained from Novinka x *T. compactum*. Crosses between Moskovka and Diamant [Diamond] and Moskovka and Flora 5 gave many segregates, some of the hybrids obtained having larger grains and giving higher yields than Moskovka. Preston is a variable variety from which long-eared types have been selected in Leningrad and Lithuania. A large-grained form of hard wheat showing resistance to diseases has been selected from Hordeiforme 27 in the Kalinin province. Selection had an adverse effect upon the productivity of the local population Gorickaja, as its yield is determined by cross pollination between its various components.

905 HALL, O. L.
Hybridization of wheat and rye after embryo transplantation.
Hereditas, Lund 1954 : **40** : 453–58.

In experiments at the Institute of Genetics, University of Lund, Sweden, the crossability of the spring wheat Ella with the spring rye Od was significantly increased if the wheat parents had been derived from embryos transplanted on to rye endosperm. Approximately five times as many wheat-rye kernels were formed by wheat mother plants raised from embryos transplanted on to rye endosperm as on plants produced from embryos transferred to wheat endosperm.

906 RAGULIN, A. A.
(Intergeneric hybrids of wheat and *Elymus giganteus*).
Zemledelie (Agriculture) 1954 : No. 6 : 86–91. [Russian].

Seed from the cross *Triticum durum* x *E. giganteus* was obtained in 1945; it was induced to germinate only by embryo culture and three hybrid plants were obtained in 1948; one hybrid plant of *T. compactum* x *E. giganteus* was also produced. The F_1 hybrids resembled the *Elymus* parent in morphology and were larger than either parent; they were much later than wheat in reaching maturity and formed a large number of tillers. Quite wide morphological differences were observed between the hybrids, even those from the same parental combination. The hybrids were pollen-sterile but one grain was obtained from a *T. turgidum* x *E. giganteus* hybrid pollinated with a mixture of pollen from *T. durum* and *T. vulgare*.
The somatic chromosome number 28 was established in the hybrids from *T. durum* and 35 in that from *T. compactum*.

907 GAUL, H.
Asynapsis und ihre Bedeutung für die Genomanalyse. (**Asynapsis and its significance for genome analysis**).
Z. indukt. Abstamm.- u. VererbLehre 1954 : **86** : 69–100.

Cases of asynapsis reported in the literature are surveyed and related to genetically conditioned disturbances of metaphase I in *Triticum* spp. x *Agropyron intermedium* hybrids (cf. *PBA*, Vol. XXIV, Absts. 1834 and 2822). It is concluded that external environmental factors such as temperature and moisture content of the atmosphere have but little influence on the extent of asynapsis, which is mainly controlled by a single recessive gene. Cytological investigations of *T. aestivum* x *A. intermedium* hybrids, in which F_1 plants showed considerable variability in pairing, chiasmata frequency ranging from 2 to 20 per cell, led to the conclusion that a number of modifiers influence the degree of asynapsis in these intergeneric hybrids and are also responsible for differences in chiasma frequency. Genetically controlled asynapsis is usually accompanied by pairing in early prophase, the paired chromosomes often dividing in late prophase, thus giving rise to univalents in metaphase I. The formula $p = \frac{x^2 + x - B}{(2x - B) \times Z}$, in which p represents the number of chromosomes per cell capable of pairing, x the number of chiasmata counted, B the number of paired chromosomes and Z the number of cells in the preparation, is proposed, and supporting evidence for its universal validity for all cases of asynapsis put forward.

908 BACSA, P.
Irányított környezethatási és ojtási kísérletek eredményei Bánkúton. (**Results of experiments on the effects produced by controlled environments and on grafting at Bánkút**).
Agrártudomány 1952 : **4** : 165–67.

A preliminary account of experiments in which (1) winter wheats were sown in the spring, and (2) the embryos of Hungarian winter wheat varieties were grafted on to the endosperm of B Garnet spring wheat is given.

909 KISLJUK, M. M.
[**Soft wheat (*Triticum vulgare*) plants obtained from a branching (*T. turgidum*) wheat**].
Bot. Ž. (Bot. J.), Moskva 1954 : **39** : 545–48. [Russian].

At Leningrad, some *T. vulgare* plants were

observed in the progeny of a *T. turgidum* variety subjected to long periods of vernalization at low temperatures for three successive generations. The progenies of all modified plants remained constant, thus precluding an explanation of their conversion by hybridization. A few soft wheat plants were obtained in similar experiments with the Spanish hard wheat 20603.

910 Nečiporčuk, I. D.
(An experiment on improving winter wheats by training).
Agrobiologija (Agrobiology) 1954 : No. 5 : 24–28. [Russian].

At Ljvov, the inheritance of some winter varieties was shattered when they were grown as spring wheats for one year from nonvernalized seed. The material was then trained upon rich soil for three generations. The plants obtained matured earlier than the initial forms, had a higher 1000 grain weight, developed more productive tillers and bore more spikelets and grains in each ear. Yield increases were observed in most varieties and proved higher in local wheats such as Ostka Grodkoveckaja [Awned Grodkoveckaja] and Konstancija than in the cultivated varieties Erythrospermum 15, Ukrainka and Lesostepka 75 [Woody Steppe 75].

911 Zemit, V. Ė.
(Growing seed soaked in sap expressed from other plants).
Agrobiologija (Agrobiology) 1954 : No. 5 : 146–49. [Russian].

At Jaroslavlj, the hereditary constitutions of two spring wheats, a branched form and the variety Diamant [Diamond], were shattered when their seed was soaked in sap expressed from species of *Corydalis*, *Pulmonaria* and *Artemisia*. Some F_1 and F_2 plants showed morphological changes in respect of ear and grain characters, others were late in ripening or displayed a winter habit.

912 Maljcev, T. S.
(Methods of soil cultivation and sowing that help to obtain high and persistent yields in agricultural plants).
Zemledelie (Agriculture) 1954 : No. 9 : 13–35. [Russian].

This account of agricultural methods employed at a collective farm in the Kurgan province includes a reference to an improved form of Milturum 553 obtained by single plant selection. It is earlier and more productive than the initial form.

913 Ehrenberg, P.
Neues zu Vorkommen und Bedeutung des Spelzes (Dinkel, *Triticum spelta*) im Altertum wie jetzt. [**New information on the occurrence and importance of spelt (Dinkel, *T. spelta*) in antiquity and today**].
Z. Acker- u. PflBau. 1954 : **98** : 279–88.

It is suggested that the Rhine valley and southern Germany were the original home of spelt and that the emigrations to Italy around 1100 BC carried it to the Mediterranean area, where it was designated "far" by the Romans. Celtic settlers are said to have brought spelt to southern Britain around 500 BC and later invaders to have taken it to northern Spain in the fifth century AD. It is further suggested that the Teutonic Knights and later German settlers are responsible for its spread into eastern Europe. Evidence is put forward to support the contention that references to spelt having originated in Tibet or to its use by the ancient Egyptians have resulted from spelt being confused with Emmer. Mention is made of the areas in Europe in which spelt is still grown.

914 Bhaduri, P. N. & Ghosh, P. N.
Chromosomal biotypes in emmer wheat.
Nature, Lond. 1954 : **174** : p. 934.

Two races have been differentiated among the Indian emmer wheats (*Triticum dicoccum* var. *farrum*), on the basis of ear length, pollen size, pollen fertility and grain setting and size. They also differ cytologically, one race having two pairs of SAT chromosomes and the other only one pair. Hybridization between Indian emmer wheats and *T. vulgare* has resulted in highly sterile F_1 plants.

915 Mokrov, S. V.
(Production of new forms in spring wheats raised from germinated seed previously treated at low temperatures).
Agrobiologija (Agrobiology) 1954 : No. 5 : 56–68. [Russian].

At Odessa, germinated seed of Kahetinskaja Vetvistaja [Branching Kahetian], Melanopus 37 and Melanopus 69 was subjected for two successive generations to long periods of temperatures alternating between 10° C and —5° C or between 0° C and —5° C. The treatment resulted in each variety giving segregates belonging to botanical varieties other than the initial form. In the case of the hard wheat Melanopus 69, interspecific conversions into *Triticum vulgare*

occurred. Kahetinskaja Vetvistaja gave many *T. durum* and *T. vulgare* forms, in addition to *T. turgidum.*

916 Djokić, M.
(The induction of polyploidy in *Triticum timopheevi* and *T. monococcum* by colchicine and acenaphthene).
Zborn. Radova poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1953 : **1** : No. 2 : 100–200. [Serbian].

The value of these chemicals as polyploidy inducing substances and their effects upon plants are described. A method developed by Dommergues and consisting of dipping the plumules and radicles in a 0·05% aqueous solution of colchicine proved more satisfactory than treating the coleoptiles with 0·1% or 0·06% colchicine solutions. Acenaphthene retarded germination and had a toxic effect. It was less toxic to plants when applied to them together with colchicine, but this treatment resulted in the deformation of plumules and radicles.

917 Pisarev, V. E. & Žilkina, M. D.
(Using boron to stimulate the growth of hybrids of low fertility).
Zemledelie (Agriculture) 1954 : No. 10 : 102–03. [Russian].

The fertility of amphidiploids of *Triticum timopheevi* x *T. monococcum*, Moskovka wheat x spring rye and (*T. monococcum* x *T. persicum*) F_1 x *T. vulgare* was improved when the plants were sprayed once a week with a 0·05% boric acid solution, commencing during the phase preceding shooting. The plants produced more spikelets and grains per ear than the initial material. Selected families of the wheat-rye amphidiploid AD20 bore up to 50 grains per ear.

918 Cicin, N. V. & Kryžanovskiĭ, F. D.
(The winter Wheat-*Agropyron* Hybrid 1).
Zemledelie (Agriculture) 1954 : No. 11 : 77–79. [Russian].

At the Snigiri research station, the hardiness of Hybrid 1 (cf. *PBA*, Vol. XXIII, Abst. 2560) and its resistance to snow mould are being improved. Hybrid 1 was obtained from a cross between the perennial wheat 34085/34 and a Swedish winter type referred to as Chef-d'oeuvre, which is noted for its large grain, productive ears and resistance to lodging. The perennial form, which was selected from the progeny of a cross between an unspecified wheat variety and an *Agropyron* species, is described as winter hardy and immune from fungous diseases.

919 Redei, D. [Rédei, G.], Djerffi [Györffy], B., Mako, Ĭ. & Baroci, E.
(Conversion of winter into spring wheat).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1954 : No. 5 : 46–54. [Russian].

Examination of a large number of wheats belonging to different species showed that most of them behaved as spring wheats when sown in spring in Hungary, exceptions being winter forms of *Triticum aestivum* from N. America, Sweden, Holland and similar localities. Some varieties eared in some years and not in others. One such wheat is the Hungarian Bánkút 1201, a derivative of Marquis, and another is the American variety Alton. Seed was obtained from both these wheats in spring sowings and was again sown in spring; in each variety the number of ears per plant increased with successive sowings whilst the number of spikelets per ear decreased; the habit of the young seedlings became more erect, their leaf sheath slightly pubescent, and their winter hardiness lower; the awns became shorter, the weight of ear less and the grains smaller, lighter in colour and more vitreous.

920 Ter-Avanesjan, D. V.
(Fresh data on the origin of new forms and species in wheat).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1954 : No. 2 : 31–35. [Russian].

Pollinating F_1 hybrids of soft or hard wheats with very small amounts of pollen resulted in their inheritance being shattered and different botanical forms arising in their progeny. F_1 hybrids of Pseudomeridionale 122a x Alborubrum and Melanopus 6 x Coerulescens had their stamens removed and were self pollinated with two pollen grains per floret. In the case of the F_1 of Balaganka 81/4 x Albidum 24, the method was modified by substituting a small amount of mixed pollen from both parental forms for self pollen. New forms occurring in the progeny of the experimental hard wheat included *Triticum vulgare*, spelt wheats and squareheads, while *T. vulgare* gave rise to awnless forms of *T. turgidum*, a spelt resembling *T. timopheevi* and awnless forms of *T. durum.*

921 Ukolov, A. A.
(Intervarietal hybridization of winter wheats).
Agrobiologija (Agrobiology) 1954 : No. 4 : 26–34. [Russian].

A new hardy form of Moscow 2453 giving 3·6 c. more grain per ha. and possessing a higher 1000

grain weight and gluten content than the initial variety has been obtained by intervarietal open pollination followed by selection in the F_1 and later generations for the maternal type.

922 Hopf, M.
Anatomische Untersuchungen an Weizenspelzen und -körnern verschiedener Polyploidiestufen als Vorarbeit für die Bestimmung prähistorischer Funde. (**Anatomical investigations of the glumes and grains of wheats of different degrees of polyploidy as a preparatory work for the determination of prehistoric finds**).
Züchter 1954 : **24** : 174–80.

Anatomical data, dealing mainly with the outer and inner glumes and the stomata and siliceous inclusions of the grain, are provided for a wide range of diploid, tetraploid and hexaploid wheats as a guide to the identification of prehistoric remains. Plates illustrating how impressions left by grains of different species may be distinguished are included.

923 Pence, J. W., Weinstein, N. E. & Mecham, D. K.
Differences in the distribution of components in albumin preparations from durum and common wheat flours.
Cereal Chem. 1954 : **31** : 396–406.

Visual comparisons of paper electrophorograms indicated that (1) the durum preparations contained large amounts of α albumins but only low concentrations of the β and γ groups, and (2) in the preparations from the club and common wheat flours the β group was present in the greatest amounts, with β-2 and β-3 predominating. These differences in albumin constituents were apparently independent of differences in crop year and locality of cultivation. Relatively minor varietal differences in albumin components were detected among the varieties of club and common wheat.

924 Schober, K.
Geeignete Weizensorten zum Herbstanbau. (**Suitable wheat varieties for autumn sowing**).
Landwirtschaft 1954 : No. 19 : 297–99.

The importance of growing varieties producing good quality grain is stressed; on the basis of trials conducted at Fuchsenbigl, Grabenegg and Schönfeld and of tests of baking quality carried out by the Austrian Federal Institute of Crop Cultivation and Seed Testing, Marienhofer Kolben [Marienhof Club], Stamm 101 [Strain 101] and Dr. Lassers Dickkopf [Dr. Lasser's Squarehead] are recommended as the most suitable varieties for extensive cultivation in Austria.

925 Middleton, G. K., Bode, C. E. & Bayles, B. B.
A comparison of the quantity and quality of protein in certain varieties of soft wheat.
Agron. J. 1954 : **46** : 500–02.

The varieties Anderson, Coker 47–27, Taylor, Atlas 50 and Atlas 66, all of which are derived from crosses involving Fronteira or Frondoso, were found to be superior in protein percentage and gluten quality to some older varieties grown in the southern region of the USA. The above five varieties averaged 12·05% protein and 28·8 bushels per acre in uniform trials during the period 1948–50, whereas the remaining eight wheats studied averaged 10·91% protein and 24·6 bushels per acre.

926 Miller, H., Edgar, J. & Whiteside, A. G. O.
An improved small-scale dough expansion test for the estimation of wheat quality.
Cereal Chem. 1954 : **31** : 433–38.

The authors have previously described a dough-expansion test involving the principle of expanding a fermenting dough in weak salt solution, the expansion being measured by the displacement of the solution. They now describe improvements in equipment and procedure. Five-gramme samples of flour are sufficient for testing the doughs. Highly significant correlations between expansion and loaf volume were obtained in tests of a large number of samples from breeding material.

927 Shogren, M. D. & Shellenberger, J. A.
The design, construction, and use of micro baking equipment.
Cereal Chem. 1954 : **31** : 475–82.

A description is given of baking equipment and procedures suitable for testing a large number of small samples of flour at an early stage in a wheat breeding programme.

928 Harada, K.
(**On resistance to potassium deficiency in wheat varieties**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 35–36. [Japanese].

A comparison of ear and straw development in nine Japanese varieties under conditions of (1) potassium adequacy and (2) potassium deficiency is reported. Varietal differences in response

to deficiency were noted, varieties with many ears suffering most while those with a high grain weight per ear were least affected.

929 Ardašev, M. I.
(Hard wheat under Baškirian conditions).
Zemledelie (Agriculture) 1954 : No. 9 : 102–05. [Russian].

The variety Narodnaja [Popular] is described. It gives higher yields than other hard wheats cultivated in Baškiria and displays resistance to lodging, shedding, bunt, rust and mildew.

930 Medvedev, A. M.
(Spring wheats grown on state farms in the Mongolian People's Republic).
Zemledelie (Agriculture) 1954 : No. 12 : 94–97. [Russian].

In Mongolian trials, Sarrubra outyielded all other varieties under rain-fed conditions, besides being notable for good grain quality, earliness and resistance to shedding, bunt and smut. The local variety Lutescens Inhitaljskaja did well on irrigated land, for although it matured later than several other high-yielding local varieties, it surpassed them in resistance to shedding and diseases and produced larger grain.

931 Horovitz, N.
Un aspecto inmunológico en el mejoramiento del trigo en la República Argentina. **(An immunological aspect in wheat breeding in Argentina).**
Idia 1954 : No. 79 : 4–6.

Several lines produced by the Instituto de Fitotecnia [Plant Breeding Institute] in Argentina possess combined resistance to a number of parasites. Thus G–1–3–3–1–0–3–1, now named Magnif G, produced by crossing a selection from H44 x Sinvalocho MA with a selection from the Brazilian line 2018/37 from Fronteira x Mentana, is resistant to *Puccinia graminis*, *P. glumarum* and *P. rubigo-vera* in the field, laboratory tests showing it to possess resistance to several races of *P. graminis*; from among 6000 seedlings from crosses of Magnif G with Tenmarq, one has been found which combines a degree of resistance to the three rust species greater than that of Magnif G with resistance also to *Septoria nodorum*; it is 20 days later than 38 MA and has weak straw but will probably be useful for breeding and has been named Magnif MG. In artificial infection tests it has displayed resistance both to races 15 and 17 of *P. graminis* var. *tritici*.

932 "Generoso" di nome e di fatto.
("Generous" in name and deed).
G. Agric. Domen. 1954 : **64** : p. 284.

The new wheat Generoso [Generous], produced by Michahelles from a back cross of a hybrid Autonomia x Mara with Mara, is described as suitable for central Italy, tolerant of poor ecological conditions, resistant to diseases and high in yield.

933 Horovitz, N.
Nueva variedad en trigo para la provincia de Entre Ríos. **(A new variety of wheat for the Entre Ríos province).**
Idia 1954 : No. 78 : 7–8.

The new variety Magnif Entrerriano MAG is a derivative of the Brazilian hybrid Frontana (Fronteira x Mentana), which was crossed in Argentina with a selection from Sinvalocho x (Heines Kolben x 38MA). The new wheat gives good and reliable yields, having exceeded Klein Cometa by 50% in 1949–52; it is equal to Sinvalocho in earliness, has short strong straw and is resistant to lodging, shedding and *Puccinia glumarum* and *P. graminis*, semi-resistant to *P. triticina* and *Septoria nodorum*, but susceptible to *S. tritici* and *Ustilago tritici*. In baking quality it is somewhat superior to 38MA.

934 M., C.
"Fraschetta." **(Fraschetta).**
G. Agric. Domen. 1954 : **64** : p. 302.

The new wheat Fraschetta produced by Prof. Jacometti is described as early, capable of yielding well under varied, even relatively unfavourable conditions, high in tillering capacity and resistant to cold and the main diseases. It arose as a white mutant in the progeny of a cross between two red wheats, Rosso di Salmour [Salmour Red] and Villa Glori.

935 Miržinska, J.
Prikaz prvih selekcija ozime pšenice zavoda za poljoprivredna ispitivanja u Kruševcu. **(The first breeding results with winter wheats at the Kruševac agricultural research institute).**
Arh. poljopr. Nauk 1953 : **6** : No. 11 : 45–73.

Three recent wheat selections combining high yield, good grain quality and resistance to lodging and diseases are described. Line 4082, a hybrid between a local *ferrugineum* form and Manitoba, is an alternative wheat preferring a rich soil; Lines 22 and 2217 have moderate soil

requirements. Line 22 was obtained by single plant selection from a land variety originating from Novi Sad and Line 2217 from a cross between Dakota and a local *erythrospermum* form.

936 Maliani, C.
Frumenti eletti anziani e nuovi di fronte all'esperienza di un'annata nera. (**Old and new pedigree wheats in the face of experience in a black year**).
G. Agric. Domen. 1954 : **64** : 291–92.

The exceptionally bad summer of 1954 caused a reduction in wheat yields in Italy varying from 20 to over 50% and very clearly demonstrated the superiority of certain varieties under adverse conditions. Thus San Pastore 14 excelled all others in cold resistance in the higher land, Funo was outstanding on medium ground, Mara in the most fertile areas and Est Mottin in the Apennine heights. Among the newly bred varieties, Giuliari, Generoso and Campodoro displayed the highest degree of cold resistance, in addition to which, Giuliari stands well and Generoso withstands the wet cold of clay soils and has yielded up to 40 q. per ha. in the Florence area. Other varieties that receive favourable mention are Elia for its standing capacity, Impeto, Verna and Titano for high ground and Grifoni 235, a durum wheat possessed of earliness and strong straw.

937 Semkina, P. F.
(**Improving the hardiness of winter wheats by directed training**).
Zemledelie (Agriculture) 1954 : No. 12 : 102–04. [Russian].

The method described was developed at Harjkov and consists of exposing plants that have been vernalized for 35–37 days to temperatures of —4, —6 or —8° C during the winter. Hybrids, especially first and second generation hybrids, showed a greater increase in frost resistance than pure varieties. The hardiness of some material was improved by extending the treatment to the following generation.

938 Hoeser, K.
Über die Prüfung von Winterweizen auf Winterfestigkeit in Auswinterungskästen. (**On testing winter wheats for hardiness in outdoor boxes**).
Züchter 1954 : **24** : 353–57.

A method is described by which cereals may be tested for hardiness by planting seedlings out in boxes raised some 50 cm. from the ground and completely filled with soil in order to expose the plants without protection to winter conditions. The results of trials of 47 varieties of winter wheat conducted at the Weihenstephan Research Station, Bavaria, from 1949 to 1954 indicated that, in mild winters, this method gave more satisfactory results than planting in the field. In severe winters the results obtained tallied very closely with those from field trials.

939 Vettel, F.
Die Ursachen der Auswinterung von Winterweizen 1953/54 und welche Schlüsse wir daraus ziehen müssen. (**The causes of the winter killing of winter wheat in 1953-54 and what conclusions we must draw therefrom**).
Dtsch. Landw. Berl. 1954 : **5** : 469–72.

A description of various causes and types of winter injury is followed by a brief reference to cultural measures and varietal characteristics as factors in productivity.
Some yield figures from wheat trials in Germany are cited to show the winter hardiness of the varieties tested and the vernalization period required by each. Tolerance of late sowing seems possibly to be associated with a short vernalization period.
The severe winter of 1953–54 confirmed the existence of marked variation in winter hardiness between various morphologically pure lines. Other winter wheat characteristics for inclusion in the East German breeder's programme are good yield and baking quality and resistance to lodging.

940 Rozentreter, N. A.
(**Methods of improving the yield of the spring wheat Hordeiforme 496**).
Zemledelie (Agriculture) 1954 : No. 10 : 87–94. [Russian].

At Gorjkiĭ, the drought resistance and productivity of the above variety were improved when (*a*) it was open pollinated by Narodnaja [People's], Hordeiforme 10, Akmolinka 5 or Bezenčuk 675, (*b*) it was crossed with Narodnaja, or (*c*) its embryos were transplanted on to the endosperms of either the soft wheat Gorjkiĭ 15 or a local *Triticum dicoccum* variety.

941 Helmerick, R. H. & Pfeifer, R. P.
Differential varietal responses of winter wheat germination and early growth to controlled limited moisture conditions.
Agron. J. 1954 : **46** : 560–62.

The differences exhibited by 12 varieties in ability to germinate and establish good stands when grown at three centres in Wyoming during

1953 were interpreted as being due to differences in response to conditions of limited supply of moisture. The varieties Cheyenne and Yogo were chosen for laboratory tests. Under field conditions, Yogo was superior to Cheyenne in germination and growth. When the two varieties were grown in (1) mannitol solutions and (2) soil in which the moisture had been reduced by applying a pressure of 7 or 11 atmospheres, Yogo germinated and grew significantly better than Cheyenne, the field observations thus being verified. Further work is in progress to determine the value of these tests as methods of selection.

942 Aebi, H.
La lutte contre la carie naine du froment. (**The battle against dwarf smut of wheat**).
Rev. rom. Agric. 1954 : **10** : 77–79.

All the Swiss, Austrian and French winter wheats tested for resistance to *Tilletia brevifaciens* at the Federal Agricultural Research Station, Lausanne, Switzerland, proved highly susceptible; the American varieties Wasatch, Hymar, Cache and Rex proved moderately resistant.

943 Johnston, C. O. & Levine, M. N.
Physiologic races of *Puccinia rubigo-vera tritici* in the United States in 1953.
Plant Dis. Reptr. 1954 : **38** : 647–48. (Mimeographed).

Information is given on the chief physiological races of *P. rubigo-vera* var. *tritici* isolated from collections made on wheat in the United States during 1953. Race 5, representing 28·4% of the total number of isolates, was the most prevalent, followed by race 15 as the second and race 105 as the third in prevalence. The marked decline in the abundance of race 9 and its relatives in recent years can probably be traced to changes in the wheat varieties grown on large acreages.

944 Hoeser, K.
Untersuchungen über die physiologische Spezialisierung des Weizenschwarzrostes. (**Investigations on the physiological specialization of black rust of wheat**).
Phytopath. Z. 1954 : **22** : 301–04.

Examination at the Bavarian State Seed Station, Weihenstephan, of samples of wheat infected with black rust showed that races 21 and 90 were the most prevalent in southern Germany and Austria during 1952 and 1953. Seventeen other races were also identified.

945 Athwal, D. S. & Watson, I. A.
Inheritance and the genetic relationship of resistance possessed by two Kenya wheats to races of *Puccinia graminis tritici*.
Proc. Linn. Soc. NSW 1954 : **79** : 1–14.

The results of studies at the University of Sydney on the inheritance of resistance to stem rust in Kenya 744 and 117A are reported. In both these varieties, resistance to races 126, 126B, 222AB and 222BB depended upon a single dominant gene. A high positive correlation existed between seedling and mature plant reaction but resistance in the field appeared to be influenced by a number of modifiers. Resistance to race 38 was determined by two dominant factors, one of which was present in both varieties and was identical with the factor giving resistance to races 126, 126B, 222AB and 222BB. The second factor in Kenya 117A also gave resistance to race 122, to which Kenya 744 was susceptible. It is therefore concluded that the second factor in Kenya 117A differs genetically from its opposite number in Kenya 744. The resistance to stem rust of Kenya 117A over such a wide geographical area is thought to be due to a number of minor genes operating independently of the major genes mentioned above. The value and limitations of Kenya 744 and 117A for breeding purposes in Australia are discussed.

946 Chavan, V. M., Patil, J. A., Chaudhari, B. B. & Shaikh, Y. N.
Rust resistant wheats for Bombay.
Indian J. Genet. 1954 : **14** : 1–12.

Breeding work on *Triticum vulgare, T. durum* and *T. dicoccum*, carried out at the Niphad Agricultural Research Station during the last two decades, to develop rust-resistant varieties is surveyed. In breeding *T. vulgare*, resistant selections, designated the Kenphad series, have been developed from Kenya E144 x Niphad 4 and distributed for general cultivation in the 1950–51 season. Promising selections have also been secured from other crosses, notably Kenya C10854 x Niphad 4, Niphad 4 x Hofed 1 and Mondhya–417–5 x Hofed 1. In recent work on *T. durum*, the variety Gaza, introduced from Canada, has been used extensively as a rust-resistant parent. The problems involved in breeding for rust resistance, such as the occurrence of physiological races and the effect of temperature and other environmental factors upon resistance, are indicated, and a future programme of breeding, including interspecific and intergeneric hybridization, is outlined.

947 THORPE, H. C.
Note on the naming of "Kenya Farmer" wheat.
Canad. J. agric. Sci. 1954 : **34** : p. 544.

The Kenya wheat 338 AC 2 E 2, a noncommercial selection, is being used extensively in Canada and the USA as a source of rust resistance in breeding. In agreement with the Kenya Department of Agriculture, the variety has been named Kenya Farmer. It was developed from Cross 338 (192 Q 2 A L x Australian 27/2 2 15); the first parent originated from Button's x 73 D 2 I 1, the second from (Bobin x Gaza) x Bobin.

948 SCHNACK, B.
"El Gaucho F.A.," nueva variedad de trigo creada por el Instituto Fitotécnico de "Santa Catalina." (**Gaucho FA, a new wheat variety produced by the Santa Catalina Plant Breeding Institute**).
Rev. Fac. Agron. B. Aires 1954 : **30** : 129–30.

The variety described is a selection from Riccio x Lin Calel and is somewhat superior to Sinvalocho MA in baking quality, yield and resistance to *Puccinia graminis*; it ripens four days later.

949 VOLPRECHT, J.
Šlechtitelsky zlepšená pšenice "Chlumecká 12" s větší odolností proti rzi a poléhavosti. (**An improved wheat, "Chlumecká 12," with a higher degree of resistance to rust and lodging**).
Za Socialist. zeměd. 1954 : **4** : 1132–34.

A detailed account of the development and pedigree of this high-yielding winter wheat, which has been improved by single plant selection in recent years, is given. It is hardy, produces large vitreous grain and shows resistance to rust, but its tendency to lodge has not been completely overcome.

950 DANTUMA, G.
Het sterk optreden van ziekten tijdens de rijping van tarwe in 1954. (**The heavy incidence of disease at the time of the ripening of wheat in 1954**).
Tech. Ber. Sticht. Coörd. Cult. Onderz. Broodgraan 1954 : No. 7 : Pp. 16. (Mimeographed).

The incidence of glume blotch of wheat in the Netherlands is discussed and the need for breeding for resistance to its causal agent, *Septoria nodorum*, is emphasized. It is claimed that the desire to obtain rust-resistant varieties has often led to breeders using *Septoria*-susceptible strains as parents, thus giving rise to an increase in damage due to this group of diseases.

951 ROANE, C. W., STARLING, T. M. & MCKINNEY, H. H.
Observations on wheat mosaic in Virginia.
Plant Dis. Reptr. 1954 : **38** : 14–18. (Mimeographed).

The authors report observations on the responses of adapted wheat varieties, breeding material and tester varieties to soil-borne mosaic virus during 1953 in a plot in Westmoreland county, Va. In general, an unusually high degree of infection of the nonrosette type was expressed; a number of varieties should, however, prove adequate as a means of controlling mosaic under less severe conditions. Breeding for mosaic resistance should be a major aim of wheat breeding in Virginia.

952 MOSEMAN, J. G., MCKINNEY, H. H. & ROANE, C. W.
Reaction of wheat varieties and selections to the soil-borne viruses in southeastern United States.
Plant Dis. Reptr. 1954 : **38** : 19–24. (Mimeographed).

The report summarizes the results of tests carried out in Virginia and North Carolina to determine the reactions of varieties and selections to mosaic rosette and yellow mosaic. Most of the entries are varieties recommended in the south-eastern region of the USA or wheats used in breeding as sources of resistance to powdery mildew or to leaf and stem rusts.

953 SCHIEMANN, E.
Einkorn im alten Aegypten? Untersuchungen zur Unterscheidung von Einkorn und Emmer (*Triticum monococcum* und *dicoccum*). [**Einkorn in Ancient Egypt? Research on distinguishing between Einkorn and Emmer (*T. monococcum* and *T. dicoccum*)**].
Züchter 1954 : **24** : 139–49.

Extensive morphological examination of charred and carbonized wheat of neolithic and VI dynasty origin from El Omari and Saqqarah, respectively, failed to reveal any trace of Einkorn. It is concluded that the existence of Einkorn in ancient Egypt has not, as yet, been proven as previous investigators may have confused Einkorn with Emmer. Detailed sketches and photographs showing differences in morphology between the two types are provided.

OATS

954 Murphy, H. C.
Registration of oat varieties, XIX.
Agron. J. 1954 : **46** : p. 525.

The variety Delair, recently registered in the USA, is described (cf. *PBA*, Vol. XXIII, Abst. 2616).

955 Bergström, C.
Förädling av tidig svarthavre—några resultat från Sveriges Utsädesförenings Övre-Norrlandsfilial. (**Breeding early black-hulled oats. Some results from the Övre-Norrland Branch Station of the Swedish Seed Association**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 198–205.

Farming conditions in Övre Norrland require a very early oat that is highly resistant to frost and fungous diseases. The extent to which Swedish plant breeders have succeeded in combining these special needs with good yield and quality is shown by a short review of the main characteristics of (1) the Orion series of oats, produced from time to time by various breeders at the Branch Station and at Svalöf; and (2) the variety Same, derived by selection from a cross of Orion II with the very early, stiff-strawed, black-grained land oat Sv25/356 from Norbotten.

Mention is also made of the variety Orion III, with its very stiff straw and handsome grain, and of further high yielding selections from Same. Another oat L01321 [(Mesdag x Orion II) x Sirius I] has surpassed Same in yield and in stiffness of straw.

956 Åkerman, Å. & Mac Key, J.
Svalöfs vithavre Seger II. (**The Svalöf white oat Seger II**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 238–40.

Seger II [Victory II], a cross between Seger and Sv33/2067, a selection from an indigenous Jämtland variety, is superior in yield of grain and strength of straw to Seger I. It should replace the latter only on soils and in localities where the Seger type is well adapted and can compete with the best new varieties, e.g. in the vicinity of the Östgöta and the Grensholm stations, where high yields have been obtained. Seger II differs from the older Seger in its lighter colour and narrower leaves, inherited from its land oat ancestor. In all but 1–2% of plants, marked pubescence was found below the topmost node of the stem. Hairs may also occur at the base of the leaves, which are moderately long and broad and slightly pendent; panicle and grain are quite like those of Seger I.

957 Eliasson, S. & Jacobson, G.
Sortförsök med havre. Sammanställning av resultaten av de av Statens Jordbruksförsök ledda sortförsöken med havre under åren 1940 (1929)–1950 (1952). [**Variety trials with oats. A collation of the results of oat variety trials conducted during the years 1940 (1929)-1950 (1952) by the National Agricultural Research Service**].
Medd. Jordbruksförs. 1954 : No. 48 : Pp. 108.

The results of trials conducted by local and other agricultural bodies at many experimental farms in Sweden are recorded in detail, but experiments carried out by plant breeding institutes are not included. A pedigree chart of the varieties tested indicates their ancestry and interrelationship and a map of the agricultural regions of Sweden is provided for use in considering the data regarding yield, earliness, strength of straw, hectolitre weight, 1000 grain weight and husk percentage of the different varieties. An appended bibliography of Scandinavian literature on oats includes references to the results of trials conducted by plant breeding institutes.

958 **Can plant Cimarron oat either in spring or fall, says Oklahoma station.**
What's New Crops Soils 1954 : **7** : No. 2 : p. 21.

The oat Cimarron, intended for cultivation only in northern and western Oklahoma, can be used either as a winter or spring type. It is early maturing, whether sown in autumn or spring, and has shown 77·7% winter hardiness, as against 84·1% by Wintok, the most hardy variety in Oklahoma. Cimarron was developed from a few plants surviving the severe winter of 1934–35 at the Southern Great Plains Field Station, Woodward. As a winter pasture variety it is superior to Wintok.

959 Dirks, V. A.
Dupree and Waubay. Two new oats for South Dakota.
Bull. S. Dak. agric. Exp. Sta. 1954 : No. 436 : Pp. 8.

The varieties Dupree [(Anthony x Bond) x (Richland x Fulghum)] and Waubay (Clinton x Marion) are described in detail (cf. *PBA*, Vol. XXIV, Abst. 2885).

960 Wallace, A. T., Middleton, G. K., Comstock, R. E. & Robinson, H. F.
Genotypic variances and covariances of six quantitative characters in oats.
Agron. J. 1954 : **46** : 484–88.

Genetic and nongenetic variances and covariances were determined for F_3 and F_4 bulk families from the cross Letoria x Fulwin with respect to yield, weight per seed, seed number per panicle, culm number per plant, seed number per plant and height. Estimates of genetic coefficients of variability ranged from 5·2 for seed weight to 15·3 for seed number per panicle. The data suggested that the magnitude of the true genotype variance was such that progenies possessing as much as 15–18% genotypic superiority for yield, compared with the population average, could be selected. It is, however, emphasized that more information is required on the effects of spacing before such a prediction can be accepted without reserve. The problem of the extent to which the superiority of selected progenies would be transmitted in crosses between progenies is considered; in this connexion the relative importance of non-additive gene effects as a source of genotypic variability should be investigated. Correlations calculated from the covariance components indicated that in selection use of the characters studied other than yield would be of no practical value.

961 Karauljnyĭ-Zverev, N. V.
(Facts concerning interspecific variability of oats).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1954 : No. 4 : 32–36. [Russian].

Instances cited include the conversion of oats into *Avena fatua* and vice versa. Some forms with a secondary panicle extending from the upper leaf sheath and yielding 20–25% more grain than other plants of the same variety were also observed. Seed from the secondary panicles gave a higher percentage of plants with secondary panicles than did seed from the main panicles. Two plants resembling *A. nuda* were found among oats grown from the main panicles.

962 Kisljuk, M. M.
(*Avena fatua* obtained experimentally from oats).
Agrobiologija (Agrobiology) 1954 : No. 4 : 120–22. [Russian].

At Puškin, conversions of the variety Orel into *A. fatua* occurred when germinating seed was kept for several generations at temperatures below zero prior to sowing. This treatment was devised for developing vigorous material with shattered inheritance. No *A. fatua* plants were obtained in similar experiments with Zolotoĭ Doždj [Golden Rain].

963 Vaščenko, A.
(The new oat variety Sahalin 1).
Zemledelie (Agriculture) 1954 : No. 8 : p. 112. [Russian].

Sahalin 1, selected from local material in Sahalin, shows resistance to lodging, shedding, pests and diseases. In recent trials it has persistently outyielded Mestnyĭ 1 [Local 1].

964 Brown, C. M. & Shands, H. L.
Behavior of the interspecific hybrid and amphiploid of *Avena abyssinica* x *A. strigosa*.
Agron. J. 1954 : **46** : 557–59.

Some highly or completely sterile F_1 plants were secured from the above cross; they possessed the panicle type of *A. abyssinica* and the crown rust resistance of *A. strigosa*. Eight colchicine-induced amphidiploids showed a range in fertility from 4 to 68%; seven of these were highly resistant to crown rust. The presence of ring and chain formations at diakinesis in some pollen mother cells of the amphidiploid form indicates partial homology between the *A. strigosa* genome and one or both genomes of *A. abyssinica*. One to several lagging chromosomes were observed in a number of cells at anaphase I. It is suggested that if the amphidiploid shows some degree of cross fertility with *A. sativa*, use could be made of *A. strigosa* as a source of crown-rust resistance.

965 Markitantova, I. V.
(Free wind pollination in oats).
Zemledelie (Agriculture) 1954 : No. 6 : 96–97. [Russian].

A standard variety of *Avena sativa* was sown in alternating rows with *A. byzantina* and its panicles were emasculated; the percentage set varied from 4·5 to 44·1%. When two *A. sativa* varieties were used, the local Leningrad variety Oljhovskiĭ as seed parent and a mixture of large-grained varieties of the Victory type as pollen parent, the set was 8·4% and the 1000 kernel weight increased from 30·4 to 45·3 g. Intravarietal crossing on the same lines gave sets of 8·5 to 9·7% and an increase in 1000 kernel weight from 30 to 43·7 g. The plants from intervarietal and intravarietal crossing gave 1·6 and 2·6 productive tillers per plant respectively, compared with 1·4 in the uncrossed control, and yielded 1·21 and 1·42 g. of grain per panicle compared with 0·66 in the control.

966 Åkerman, Å. & Hagberg, A.
Intraspecific sterility in oats.
Hereditas, Lund 1954 : **40** : 438–52.

Breeding carried out at the Swedish Seed Association, Svalöf, with the object of combining the growth habit of the black oats of central Sweden with the grain quality and other valuable characters of the Probstei type grown in southern Sweden, has so far been unsuccessful on account of the partial sterility shown by the hybrid derivatives. At metaphase I in the F_1 of white x black oat crosses approximately 56% of the pollen mother cells showed either univalents or multivalents, or both these irregularities. At anaphase I, about 45% of the cells had laggards, and 15% bridges, mostly without fragments. At anaphase II, approximately 51% of the cells contained lagging chromatids, some showing misdivision. These irregularities are chiefly ascribed to structural differentiation of the parent varieties. None of the parents used had more than 5% of pollen mother cells with irregularities. F_1 pollen and seed fertility did not reflect the high frequency of meiotic disturbances, possibly because the allohexaploidy of oats allows it to tolerate gametes with abnormal genotypes.

967 Vigorov, L. I.
(**The protein contents of naked forms of barley and oats grown upon the grey forest soils of the central Urals**).
Zemledelie (Agriculture) 1954 : No. **11** : 89–92. [Russian].

Oats. Naked forms tested in the Sverdlovsk province produced 30–40% more protein than local hulled forms. Some varieties, such as Pioner [Pioneer] and Primorskiĭ 163/1, gave as much grain as the hulled oats Zolotoĭ Doždj [Golden Rain] and Orel.

Barley. Some naked forms matured early and produced high yields; of these, Paradiz [Paradise] and Nudum 02/4 were outstanding in the quality of their grain. The protein and peptone contents of most naked forms were dependent upon environmental factors, although some forms appeared to be less susceptible to external conditions than others.

968 Hellbo, E.
Vippgrensknutan som sortkännetecken hos havre. (**The swollen base of the primary panicle branches as a varietal character in oats**).
Medd. Frökontrollanst., Stockh. 1954 : No. 29 : 41–46.

The shape, size and hairiness of the above mentioned structure has been shown by examination of white oat panicles of numerous varieties to be a good varietal character, though care must be taken in diagnosis to allow for environmental modifications. A similar study of black oats, for which other adequate identifying characteristics are already known, is still in progress.

969 Åkerman, Å.
Studier rörande råprotein- och fetthalt hos några vithavresorter av probsteiertyp. (**Studies concerning the content of crude protein and fat in some white oat varieties of the Probstei type**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 261–77.

Analyses carried out by the Chemical Department of the Swedish Seed Association have revealed appreciable differences in the crude protein content of different varieties of oats. Guldregn I [Golden Rain I] and II and the more recent varieties Örn [Eagle] and Sol II [Sun II] have a higher protein content than Seger [Victory]. Thus high yield and high protein content are not incompatible; and in the writer's view the same combination is also possible for wheat.

Though the fat content of oats varies less than the protein, varietal differences do exist. Örn combines high protein and fat content.

970 Lapalme, A.
Nature de la résistance de l'avoine à la rouille de la tige. (**Nature of the resistance of oats to stem rust**).
Rev. Oka 1954 : **28** : 138–54.

The incidence of *Puccinia graminis* var. *avenae* in Canada is surveyed, with particular reference to Québec province. After a brief mention of the physiological nature of resistance and its genetical basis, the author discusses the occurrence of physiological races of the pathogen and the role of barberry as a host plant. Notes on the agronomic properties of resistant varieties suitable for cultivation in Québec are given.

971 Simons, M. D.
A North American race of crown rust attacking the oat varieties Landhafer and Santa Fe.
Plant Dis. Reptr. 1954 : **38** : 505–06. (Mimeographed).

In tests at the Iowa Agricultural Experiment Station, Ukraine and Victoria were the only varieties of *Avena sativa* exhibiting resistance to race 263 of crown rust, which attacks Landhafer, Santa Fe and several other varieties. The

A. strigosa varieties Saia and Glabrota were highly resistant.

972 Simons, M. D.
Physiologic races of crown rust of oats identified in 1953.
Plant Dis. Reptr. 1954 : **38** : 649–52. (Mimeographed).

Using the new set of ten differentials (Anthony, Victoria, Appler, Bond, Landhafer, Santa Fe, Ukraine, Trispernia, Bondvic and Saia), a total of 18 races was identified at the Iowa Agricultural Experiment Station among the isolates collected from oats in the USA and Canada during 1953. As in the past four years, race 202, attacking Bond, Anthony and Appler, predominated. The identification of race 263 from Manitoba, causing infection of Landhafer, Santa Fe, Trispernia and Bondvic, was a notable result of the racial analysis; these four varieties were however resistant to all other collections.

973 Finkner, R. E.
Inheritance of resistance to two races of crown rust in oats.
Iowa St. Coll. J. Sci. 1954 : **28** : p. 314. (Abst.).

Investigations on the inheritance of reaction to races 57 and 109 of *Puccinia coronata* var. *avenae* led to the following conclusions. Clinton carried a dominant gene (*A*) for resistance to race 109 and recessive alleles of factors for resistance to race 57. The resistance and susceptibility of Ukraine to race 57 and 109, respectively, depended upon the same gene, *M*. Two dominant linked genes, M_1 and U_1, determined the resistance of Santa Fe to both races, *M* being dominant to M_1. In Trispernia, resistance to both races apparently depended upon two factors, M_2 and V_1. The resistance of Landhafer to both races was conditioned by a partially dominant factor, *L*, epistatic to *M* in a test with race 109. In Klein 69b resistance to both races depended upon a partially dominant gene *K*, whose effect of conferring resistance was inhibited by *M* in a test with race 109. In Victoria, resistance was governed by *V*, dominant to V_1 and apparently epistatic to one of the two linked genes in Santa Fe.
Susceptibility to *Helminthosporium victoriae* was monogenically controlled and completely linked with the Victoria type of crown-rust resistance. Several varieties and selections commonly used as crown-rust resistant parents apparently consist of mixtures of genotypes for reaction to this disease.

974 Finkner, V. C.
Genetic factors governing resistance and susceptibility of oats to *Puccinia coronata* Corda var. *avenae*, F. and L., race 57.
Res. Bull. Ia. agric. Exp. Sta. 1954 : No. 411 : 1040–63.

The author presents a detailed account of investigations referred to in *PBA*, Vol. XXII, Abst. 1841. Six loci were found to govern reaction to race 57 of *P. coronata* var. *avenae*: *K*, *M*, *U*, *V* and *L* for resistance and I_k inhibiting the expression of *K*. The resistant oats studied were homozygous for the following genes: Landhafer, *L*; Santa Fe, M_1 or M_1U_1; Victoria, *V*; Ukraine, *MU*; Klein 69B, *K*; Trispernia, M_2 and possibly one or two other factors whose allelic relationships were not established; and Anthony-Bond x Boone, M_2V_1 and possibly one other factor. The susceptible variety Clinton contained I_k. With respect to the remaining loci, the genotype of each of these eight oats was recessive. The genes *M* and *U* were linked with a recombination value of 22·88 ± 0·4%. Suggestions as to the dominance and epistasis relationships of the various genes are given.

975 Konzak, C. F.
Stem rust resistance in oats induced by nuclear radiation.
Agron. J. 1954 : **46** : 538–40.

Thermal-neutron irradiation of seeds of the variety Mohawk induced mutants resistant to race 7a of *Puccinia graminis* var. *avenae* in the seedling and adult stages. This resistance apparently depended upon a single dominant gene. In the seedling stage, the mutants displayed a type 1 reaction to race 7a, similar to that shown by Richland. Other mutants were also obtained, including seedling mutants of the virescent, *virido-luteus*, yellow-green and banded-leaf types, mutants for plant height, fatuoids, awned types and black-seeded individuals.

976 Earhart, R. W. & Moseman, J. G.
Possible desirable germplasm in new oat introductions grown in Florida and North Carolina in 1952-53.
Plant Dis. Reptr. 1953 : **37** : 597–98. (Mimeographed).

Some introductions combining resistance to crown and stem rust and to mosaic may prove useful in oat breeding in the south-eastern United States.

977 Derick, R. A.
A survey of varietal resistance to black stem (*Septoria avenae*) in oats in Eastern Canada.
Plant Dis. Reptr. 1954 : **38** : 85–87. (Mimeographed).

Out of the large number of varieties and introductions studied, 11 were classed as resistant to *S. avenae* at all five of the test localities. Three of these belong to *Avena sativa*: CD1030, a German introduction with slender, dark brown and unattractive kernels, and CD5022 and CD4090, both from Wales, with attractive white kernels.

978 Williams, J. H.
Differential varietal response of oat varieties to 2, 4-dichlorophenoxyacetic acid.
Agron. J. 1954 : **46** : 565–69.

The 13 varieties tested for two seasons at Ames, Ia., exhibited significant differences in response to applications of 2:4-D 26, 30 and 34 days after sowing. The greatest reduction in yield occurred by treatment during initiation of the floral primordia. It is suggested that differential response of varieties is partly due to dissimilarities in the stage of development of the growing point at the particular time of treatment.

RYE

979 Bauer, F.
Új heterózis rozsnemesitési eljárás bevezetése a kecskeméti kisérleti gazdaságban. (**Introduction of a new procedure for improving rye by means of heterosis at the Kecskemét Experimental Farm**).
Agrártudomány 1953 : **5** : 138–39.

A breeding method in which a block of mass crossed material is planted out in a field, surrounded by blocks of other varieties, and allowed to set grain by selective open pollination is described. Special attention is also paid to the soil conditions under which the progenies are reared. A new high yielding variety, Kecskeméti heterózis [Kecskemét Heterotic], has been produced by this method.

980 Müntzing, A.
An analysis of hybrid vigour in tetraploid rye.
Hereditas, Lund 1954 : **40** : 265–77.

Tetraploid strains of the varieties Petkus, Steel and King were intercrossed and the resulting three F_1 combinations compared with the parents in a yield trial. Kernel yield per plot was significantly higher in the F_1's than in the parents, the superiority over the parental average ranging from 18·4 to 18·8%. The increased F_1 kernel yield was the ultimate result of a series of relatively small superiorities in component characters, particularly number of flowers per ear, percentage of seed setting and number of mature plants per plot. Other cases of "combination heterosis" are discussed. The view is expressed that all types of heterosis are more conveniently assessed by comparisons of the F_1 with the average value for the parents than with the parent having the higher value for a given character.

981 Hintzer, H. M. R. & De Miranda, H.
Investigations on the quality of diploid and tetraploid rye for breadmaking.
Cereal Chem. 1954 : **31** : 407–16.

The baking quality in eight varieties of diploid rye grown at six centres in the Netherlands during 1948 was negatively correlated with maltose value and α-amylase activity and positively with maximum viscosity. In comparison with the environment, variety had little influence upon quality. Tetraploid rye was higher in protein content, lower in α-amylase activity and better in baking quality than diploid rye. Tetraploid rye is probably more resistant to sprouting than diploid varieties.

982 Ellerström, S. & Hagberg, A.
Competition between diploids and tetraploids in mixed rye populations.
Hereditas, Lund 1954 : **40** : 535–37. (Abst.).

Preliminary data on the behaviour of populations grown at Svalöf, Sweden, from tetraploid seed mixed with 0–32% diploid seed indicate that tetraploids possess sufficient competitive ability, with respect to both their reproductive efficiency and vegetative suppression of the diploids, to maintain a good level of purity in seed multiplication.

983 Britikov, E. A. & Petropavlovskaja, R. N.
(**The effect of enzymes, vitamins and auxins upon the grain set of an inbred rye**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1954 : **97** : 341–44. [Russian].

The winter rye Vjatka set 10–13 times as many grains when fertilized by self pollen if certain substances present in wheat pollen were added. The result is attributed to an interaction between the reproductive organs and papaine,

vitamins or α-naphthylacetic acid amide, thereby enhancing the physiological differentiation between the male and female gametes.

984 LUNDQVIST, A.
Studies on self-sterility in rye, *Secale cereale* L.
Hereditas, Lund 1954 : **40** : 278–94.

Data on the incompatibility reactions of S_1 plants of the diploid variety Stål [Steel] when selfed, intercrossed and reciprocally back-crossed to their parents have led to the hypothesis that incompatibility in rye is determined by the combined action of two multiallelic systems of the oppositional type, designated series *S* and *Z*, respectively. Possibly series *Z* had its origin in duplication. It is suggested that under certain conditions an incompatibility system involving two loci may have a selective advantage as compared with a system involving one only.

MAIZE

985 ZONJIĆ, I.
(Statistical phenotypical correlations between some maize characters).
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1954 : **2** : 56–67. [Serbian].

The kernel weight of dent x flint hybrids was found to be correlated with ear length and kernel percentage. Analysis of plants and kernel weights suggests that plant growth and development of the reproductive organs are mutually conflicting to some extent.

986 DEL VALLE, C. G.
Notas sobre el maíz amarillo cubano. **(Notes on Cuban yellow maize).**
Rev. Agric., Habana 1954 : **37** : No. 2 : p. 60.

The yellow maize produced by the Genetical Department of the Agronomic Experimental Station in Cuba has given yields of 4600 kg. per ha. in Bolivia as compared with 2000 kg. from the local forms. It is also earlier, less damaged by corn borer and more popular on account of the size and colour of its grain.

987 JONES, C. M.
An inheritance study of corn maturity.
Diss. Abstr. 1954 : **14** : Publ. No. 7469 : 445–46. (Abst.).

The inheritance of maturity and ear weight was studied in six crosses of early x late inbred lines of maize. Earliness appeared to be due mainly to dominant genes; some degree of heterosis for earliness was probably also expressed in each cross. Early silking showed complete genic dominance, lower moisture content of ears harvested at a uniform period from time of planting partial to complete genic dominance and lower moisture content of the ears 50 days after silking no to complete dominance. Classification of inbreds entirely on the basis of silking date may not furnish the desired information on maturation. The dominant genes for earliness in inbred R53 and possibly A158 were epistatic. Inbreds containing dominant epistatic genes for earliness should provide more uniformity in maturity in a double cross of the type $(E_1 \times L_1) \times (E_2 \times L_2)$ than inbreds with dominant but nonepistatic genes for earliness. It was calculated that minimum gene numbers ranged from 5 to 19 for silking date, 2 to 11 for moisture content of ears harvested at a uniform period after planting, and from 1 to 54 for moisture content 50 days after silking. Maximum heritability values for these characters were 11–48%, 36–58% and 22–83%, respectively. In all crosses, considerable heterosis was expressed in ear weight. Maximum heritability values for ear weight indicated that little or no progress would be achieved by selection at a uniform date after harvest but that selection of the F_2 of three of the crosses 50 days after silking should lead to marked improvements in ear weight. It is suggested that early lines containing dominant epistatic genes may be combined with late lines possessing high combining ability for yield in an F_1 cross of the type $[(E_1 \times L_1)E_1] \times [(E_2 \times L_2)E_2]$.

Atti del 1° Congresso Nazionale dei Mais Ibridi, Vicenza—21 Febbraio 1954. **(Report of the 1st National Hybrid Maize Congress, Vicenza, 21 Feb. 1954).**
Genet. agr. 1954 : **4** : 183–422.

After an account of the opening ceremonies, the contributions are presented in full.

988 *Fenaroli, L. Mais* 1954: *Esperienze, considerazioni e prospettive.* (*Maize in* 1954: *experience, considerations and prospects*). (*pp. 198–210*).

Figures are presented showing that 200 thousand ha. were planted with hybrid maize in Italy in 1953, some areas such as the provinces of Brescia and Cremona having been sown over 80% of their maize land with hybrid seed; yields of up to 130 c. per ha. have been obtained. Types are available with maturity times ranging from 90 to 150 days. Attention is now being directed towards producing suitable hybrids for

southern Italy, where growing conditions for this plant are much less favourable.
Studies on the nutritive qualities of a large number of maize varieties have shown that differences exist between flint and dent types but not between varieties and hybrids as such; the lower protein content of the dent corns is more than compensated for by the higher yield of the hybrids.
The gain in value of the maize crop resulting from the use of hybrid corn in Italy in 1953 is estimated at 15 milliard lire.

989 *Montanari, V. I mais ibridi nelle Venezie: diffusione attuale e prospettive d'incrementi futuri.* (*Hybrid maize in the Venetian provinces: its present area and possibilities of future increases*). (*pp. 211–52*).
References in the early literature are cited which show that maize was introduced into the Venetian provinces in 1539 or earlier. Details are given concerning its cultivation in the intervening period up to the present day, the varieties grown and the advent of hybrid maize. Figures are given showing that the increase in yield from hybrid maize amounted to 19·4 q. per ha. in 1953 for spring sowings and 8·35 q. per ha. for summer sowings. In addition to their greater yielding ability the hybrids have shown greater resistance to drought, lodging and the effects of hail and their stems have a higher fodder value; they are somewhat more susceptible to smut than the local varieties and in some localities have been more seriously attacked by corn borer. They require somewhat higher levels of manuring, which is natural in view of their higher productivity. Chemical analyses carried out so far do not substantiate the widespread feeling that hybrid maizes are inferior in nutritional value; opinions are found to differ concerning their quality for making *polenta*. The view is expressed that too many hybrids have been put on the market and indications are given of those found most suitable for each province; yields of very nearly 115 q. per ha. are reported for some of them in 1953, when the maximum yields for Bianco perla [White Pearly] and Marano, two of the most popular local varieties, were 79·62 q. and 67·21 q. per ha. respectively.

990 *Trentin, A. La sperimentazione sui mais ibridi: osservazioni e deduzioni.* (*Experiments on maize hybrids: observations and deductions*). (*pp. 253–313*).
The results of tests of a number of hybrids in various parts of Italy in 1953 are reported in detail. Almost without exception the hybrids were more resistant to lodging and the effect of wind, rain and hail than the local varieties; some hybrids proved very susceptible to corn borer but a few were less susceptible than the local varieties; early varieties tended to be less attacked than late; it is emphasized however that improved modern methods of control make borer resistance now a secondary consideration in the choice of a variety. The hybrids that figured most often among the highest yielders were Indiana 750A, Funk's G77, Ohio C92, Embro 155, Funk's G91, U50, US 13, Maygold 99A, Iowa 4316, Wisconsin 641AA, Maygold 59A and Funk's G99, all late types, some of which in years of less favourable rainfall do not behave so well; a few of them on the other hand were in the highest yielding group in conditions of both high and low rainfall. The hybrids, particularly the late-maturing types, showed more favourable response to high doses of fertilizer than did the local varieties. In areas of lower fertility or with low summer rainfall the early or midearly varieties gave the best results, namely Wisconsin 355, Wisconsin 464, U28 and U26 among the early and U41, Maygold 99A, Funk's G77 and U32 among the midearly. As regards quality, the hybrid Insubria 2201 is quite equal to Marano Vicentino, the most popular variety for making *polenta*, and has excelled it considerably in yield in some places, though not in areas of low fertility or rainfall; the hybrid also ripens ten days later. At the plant breeding institute at Lonigo, pure line selections are being made from Marano with the object of producing hybrids combining high yield with earliness and grain qualities as near as possible to those of Marano.
Indications are given of the hybrids best suited for different types of soil.

991 *Antoniani, C. Valore alimentare del mais.* (*Nutritive value of maize*). (*pp. 323–32*).
In analyses carried out on maize flour no support has been found for the popular notion that it is deficient in vitamins of the B group; it is low in tryptophane and lysine, but high in glutamic acid and methionine. Yellow maize has a somewhat higher protein content than white, the difference being more marked in hybrid corns than in the Italian varieties. The hybrids are superior in starch content and in the digestibility of their protein but no difference was detected in the amount of arginine and methionine in the protein of varieties and hybrids. There is thus no basis for the view that hybrid maize is nutritionally inferior, those differences observed being in favour of the hybrids.

Bonvicini, M. Nuove prospettive per il miglioramento del mais in Italia.

993 (*New prospects for improving maize in Italy*). (*pp. 333–40*).

The factors which contribute to the greater yielding capacity of the American maize hybrids in comparison with the local Italian varieties are analysed and it is suggested that Italian breeders should try as many crosses as possible between the American inbreds, as it is likely that the best combinations for Italian conditions will not be those found best for America; lines obtained from Italian and other varieties should also be included. Experiments with synthetics are also recommended.

994 *Carrante, V. I mais ibridi nella Puglia e Lucania.* (*Hybrid maize in Puglia and Lucania*). (*pp. 341–48*).

Experiments with maize in these two arid provinces of Italy have shown that certain American hybrids are just capable of giving a crop without irrigation; with the increasing irrigation of this area a considerable rise in the cultivation of hybrid maize is envisaged. A study of the growth rhythm of a number of hybrids shows that the periods germination/flowering and flowering/maturity behave separately in inheritance; this should make it possible to breed hybrids with a growth rhythm more closely adapted to the climatic conditions of southern Italy than the American hybrids now available.

995 *Bianchi, A. Eterosi.* (*Heterosis*). (*pp. 349–55*).

Some of the hypotheses that have been advanced to explain heterosis are analysed.

996 *Maliani, C. La produzione ed il commercio del seme di mais ibridi americani.* (*The production and sale of seed of American maize hybrids*). (*pp. 356–62*).

There were 34 types of maize hybrids on the market in Italy in 1954 and these are considered more than sufficient for the needs of the different localities.

The official methods of certification of the hybrid seed are described.

997 *Rui, D. Maiscultura e piralide.* (*Maize growing and the corn borer*). (*pp. 363–67*).

The most effective methods of control of *Pyrausta nubilalis* and *Sesamia cretica* are outlined.

998 *Monestiroli, C. Norme per l'irrigazione dei mais ibridi.* (*Regulations for irrigation of hybrid maize*). (*pp. 368–71*).

The phases in which irrigation is most necessary are (1) when the silks are about to emerge, (2) at the time of fertilization and (3) when the grain begins to swell, about ten days after fertilization.

999 *Naldi, L. I mais ibridi nell'Italia meridionale.* (*Hybrid maize in southern Italy*). (*pp. 372–78*).

The maize types at present cultivated in the most arid areas of south Italy are all very early, low in stature and bear a small number of leaves, thus escaping the worst effects of the drought. Hybrids such as Wisconsin 355 are recommended for such localities, Wisconsin 464 for somewhat less extreme conditions and Wisconsin 641AA for the better soils with more moisture. Most dent hybrids are susceptible to corn borer and fungous diseases, whereas the flint varieties and their hybrids are mostly resistant. For this and other reasons the local flint varieties ought to serve in the parentage when hybrids are produced specially for this zone.

1000 *Miniscalco, V. Caratteristiche bromatologiche ed organolettiche dei mais ibridi dentati.* (*Characteristics of dent maize hybrids in composition and flavour*). (*pp. 379–84*).

Reference is made to certain dent hybrids which have higher contents of methionine and arginine than the majority of the flint types; the hybrids also have relatively high contents of nicotinic acid, and though they normally give a lower proportion of semola and more husk, this can be largely put right by adjustment of the mills.

1001 *Zucchini, I. La coltivazione del granoturco nel Lazio e la possibilità di diffusione dei mais ibridi.* (*The cultivation of maize in the Lazio and the possibilities of extending hybrid maize*). (*pp. 385–91*).

Early and midearly hybrids have shown promise in tests in this part of Italy where very little hybrid corn has been grown so far. The Italian hybrid Insubria 2201 has done well and it is thought that hybrids produced from local material will be required before the best results are obtained.

1002 *Jucci, C. Interventi e discussione.* (*Discussion*). (*pp. 392–415*).

The need for borer-resistant hybrids and of hybrids with grain resembling Marano in quality, and the desirability of reducing the number of hybrids on the market were among the subjects mentioned in the discussion. Prof. P. Albertario, from the chair, gave a summary of the conclusions reached at the meeting and Prof. C. Jucci presented a number of motions, in which cognizance was taken of the proven merits of hybrid corn and recommendations were made

for the pursuance of the breeding work on it, and particularly for the study of the local maize varieties with the object of using their germplasm in building up more perfectly adapted hybrids and improving the quality of grain and protein. The foundation of an Italian Society of Agricultural Genetics (Società Italiana di Genetica Agraria) was announced.

1003 Salamov, A. B.
(Some problems of maize biology).
Agrobiologija (Agrobiology) 1954 : No. 4 : 14–25. [Russian].

The results of experiments in North Osetia on hybridization, mixed pollination and supplementary pollination are presented and questions concerning the relationships between yield and provenance and between yield and colour of grain are discussed. Among new strains recently bred at the North Osetian station are Osetian 676, which gives high yields on irrigated soils, two yellow-seeded double crosses involving inbred lines selected from a Chinese variety, and a new white-seeded three-way cross. In the 1953 trials, these new strains outyielded the highly productive double cross VIR37 [Institute of Plant Industry 37] by a significant margin.

1004 Popovič, B.
(Growing maize for seed in the Nonchernozem belt).
Zemledelie (Agriculture) 1954 : No. 8 : 23–27. [Russian].

These notes on the performance and earliness of varieties and hybrids that have reached maturity under Moscow conditions include observations on their value as forage plants, notably for ensilage.

1005 Kozubenko, V. E.
(Maize breeding in Bukovina).
Zemledelie (Agriculture) 1954 : No. 8 : 92–96. [Russian].

Early and high-yielding material developed in recent years at Černovicy includes: the drought-resistant variety Zubovidnaja 3135 [Dent 3135], selected from Minnesota 13 Extra; Bukovina 1, bred from Voronež 76 x Zubovidnaja 3135; and Bukovina 2, a top cross involving Voronež 76 and an inbred line of Zubovidnaja 3135.

1006 Marić, M. M.
[Testing the (heterotic) F_1 generation obtained from crosses between some of our widely cultivated maize varieties).
God. poljoprivred. Fak./Yearb. Fac. Agric., Beograd 1952 : No. 4 : 339–62. [Serbian].

Detailed data on heterosis in some hybrids, mostly between dent varieties, are presented. The highest yields were recorded for the hybrids Šidski Zuban [Šid Dent] x Bankut Bajša and Fleischmann Dent x Bankut Bajša.

Laubscher, F. X. (Editor)
Report of the Second Annual Maize Breeders Conference of the Union of South Africa, College of Agriculture, Potchefstroom : Pp. 50. (Mimeographed).

Station Reports and discussion of station reports. (*pp. 1–12*).

1007 *Josephson, L. M. & Stead, B.* (*a*) *Potchefstroom College of Agriculture.* (*pp. 1–7*).

In the cooperative trials of white dents during the 1952/53 season, all the hybrids outyielded the open-pollinated varieties. If F_1 hybrid seed is not available, commercial use of F_2 seed is advocated. The top cross Early King x K64 is to be further tested since it is believed to be superior to the top cross already in cultivation. The top cross American White Flint x K64, which has outyielded American White Flint, is also considered to be promising. The double hybrids (A17 x A14) x (N72 x K64) and (N72 x K64) x (K55 x 33–16) are undergoing multiplication for extensive tests. The first cycle of reciprocal recurrent selection of Early King and Synthetic Potchefstroom Pearl was completed in 1951–52; twelve selections from each variety were recombined in 1952–53 for the second cycle. The selections were recombined by mixing equal proportions of all twelve to produce the male rows for pollinating each selection.

Some experimental hybrids of yellow dents and of yellow flints have shown promise. Yellow flints may prove useful for cultivating in the drier areas of western Transvaal. Only a limited amount of white flint breeding is in progress.

Sweet corn breeding is mainly concerned with the development of a yellow type suitable for canning. Texas hybrids and top crosses of yellow inbreds with Golden Bantam are to be subjected to yield trials in 1953–54. Single hybrids of the cream-style white type, superior in yield and quality to Stowell's Evergreen, have been produced.

Popcorn breeding has resulted in considerable improvements in yield, quality and popping volume compared with Japanese Hulless, the white variety used by growers. F_2 seed of these hybrids is to be released so that commercial production can begin without loss of time. In addition, seed is being imported so that the

crosses SG18 x SA24 and Purdue 32 (SG18 x SG30A) x SA24 can be produced for commercial use.

1008 *Hofmeyr, J. D. J.* (*b*) *Pretoria Agricultural Research Institute.* (*p. 7*).
Inbred lines were tested in top crosses with Potchefstroom Pearl.

1009 *Grogan, C. O. & Kuhn, C. H.* (*c*) *Bethlehem Research Station.* (*pp. 7–9*).
Seed production of the double cross (A441–5 x A272) x (A281 x A337), a possible substitute for the flint variety Yellow Boesman, is under way. Promising lines of white and yellow flint and of yellow dent have been found as the result of trials of introduced and local material. Dent-flint crosses may be more useful than crosses of dents or flints only. Cooperative trials during 1952–53 consisted mainly of three-way and double crosses. (H x A71) x A441–5 gave a good performance. Varieties and hybrids of sweet corn were tested for their quality.

1010 *Bogyo, T. P.* (*d*) *Natal Agricultural Research Institute.* (*pp. 9–12*).
Further stages were reached in the programme of reciprocal recurrent selection to improve lines derived from (1) the late white maize varieties Potchefstroom Pearl and Hickory King, (2) the yellow dents Sahara and Teko Yellow and (3) the early white types Silver King, Synthetic Anveld, ordinary Anveld and Early King. Work on each group included selection for resistance to *Helminthosporium*. The first extensive trials of locally bred experimental hybrids in Natal were planned for the 1953–54 season.

1011 *Discussion on* Puccinia polysora. (*pp. 12–16*).
Plans were laid for the cooperative testing of inbreds and hybrids in the Union and other countries of Africa.

Papers on methods of testing (*pp. 16–35*).

1012 *Josephson, L. M. & Stead, B.* (*a*) *Methods of testing maize in experimental trials, plot size, shape, spacing and population.* (*pp. 16–17*).
Plot sizes larger than 2 x 10 hills were more efficient but not sufficiently so to warrant the additional space and labour required.

1013 *Neser, F. W. C.* (*b*) *Correcting for stand*: (*i*) *Missing plant experiment with maize.* (*pp. 17–18*).
In widely spaced plots, the competitive advantage accruing to plants adjacent to missing plants was greater when the missing plants were in rows instead of being scattered. When the spacing was close, the converse situation held.

1014 *Josephson, L. M. & Stead, B.* (*ii*) *Method of correcting for stand in yield trials.* (*p. 18*).
Percentage increases in yield of hills adjacent to missing hills are given for an exploratory experiment with one top cross and one variety.

1015 *Grogan, C. O. & Kuhn, C. H.* (*iii*) *Allowing for missing hills.* (*pp. 18–19*).
Appropriate correction factors for 1–10 missing hills in 2 x 10 hill plots with 2 plants per hill were obtained from a split-plot layout in which missing hills were prepared artificially by removing the plants when 6 in. high.

1016 *Bogyo, T. P. & Rayner, A. A.* (*iv*) *Corrections to plot yields for missing hills in maize variety trials.* (*p. 19*).
A detailed analysis of a completely randomized lay-out involving the following four treatments is presented: (1) full stand; (2) one missing plant per plot; (3) two adjacent missing plants per plot; and (4) two alternate missing plants per plot. It is concluded that the use of adjustment formulae to compensate for missing plants is unjustified. For small numbers of missing plants, no adjustment is advised; for larger numbers of missing plants, adjustment by analysis of covariance is recommended.

1017 *Rayner, A. A.* (*c*) *Summary of talk "Experimental designs for maize-breeding."* (*pp. 33–35*).
A description of lattice designs suitable for trials of large numbers of varieties is given.

General papers (*Summaries*). (*pp. 35–45*).

1018 *Gorter, G. J. M. A.* (*b*) *Report on maize disease tests at Potchefstroom.* (*pp.* 36–38).
In breeding for streak resistance, work is being carried out on different types of combinations involving the variety P x H, a cross between resistant lines of Peruvian and Hickory King. Except in the case of lines with long and thin internodes, the reactions of inbreds to *Fusarium* stalk rot and those of their single crosses were in close agreement. Inbred K64 has proved to be highly susceptible to cob and tassel smut (*Sphacelotheca reiliana*) and is responsible for the susceptibility of the commercial top cross of which it is a component; an attempt to isolate a resistant strain of K64 is under way.

1019 *Grogan, C. O.* (*e*) *The effect of detasseling on yield.* (*pp. 42–43*).
Detasseling has led to significant increases in yield at Bethlehem, Orange Free State; the greatest increases have been obtained with close spacing. Varieties and hybrids have exhibited a differential reponse to detasseling.

1020 *Bogyo, T. P. The effect of detasseling on yield of maize.* (*Abst.*). (*pp. 43–44*).
In an experiment at Ukulinga, Natal, detasseling resulted in a highly significant increase in yield.

1021 *Josephson, L. M.* (*f*) *The present status of breeding for "male sterility" at Potchefstroom.* (*p. 44*).
The Texas source of cytoplasmic male sterility has proved to be more satisfactory than Ky27. Hybrids produced by means of sterile lines will shortly be available for experimental testing. The value of Eckhardt's method of simultaneously producing a form of an inbred bearing pollen-restoring genes and its cytoplasmically male-sterile counterpart is being explored (cf. *PBA*, Vol. XXIV, Abst. 159).

1022 *Kuhn, C. H.* (*g*) *A quantitative approach to flint-dent contrasts.* (*p. 45*).
Upon grinding in a burr mill, the soft starch of dent maize pulverizes to a meal whereas the flinty portion tends to granulate. Separation by an appropriate sieving method has provided a quantitative means of establishing a scale of flint-dent gradation, suitable for classifying segregates from crosses of inbreds. Preliminary data obtained by this technique suggest that (1) some degree of dominance exists in respect of the dent character, (2) flintiness is associated with some mechanism of preferential fertilization and (3) the flint-dent ratio is influenced by the cytoplasm.

1023 *Stead, B.* (*h*) *The utilization of American inbreds in the South African breeding program.* (*p. 45*).
An attempt was made to utilize the reputedly high combining ability of certain nonadapted American lines by back-crossing for two generations to adapted South African lines as the recurrent parents; the lines and their progenies were compared in crosses with a common tester. Only a few selections with high combining ability were obtained in the back crosses and these were considered to be merely new recombinations involving a more favourable gene dosage than either parent.

1024 *Sansom, T. K. Review of hybrid seed development in Southern Rhodesia.* (*pp. 45–46*).
Approximately 75% of the acreage is now sown with hybrid seed of white maize, an average increase of 20–30% being obtained. The hybrids are resistant to *Puccinia sorghi* but susceptible to *Helminthosporium turcicum.* Breeding of yellow maize was initiated a few years ago by inbreeding Reids Yellow Dent and South African varieties.

1025 *Committee Reports.* (*pp. 46a–48*).
The report of the committee for the preservation of germ plasm summarizes the results of a survey of open-pollinated varieties grown in South Africa and also the steps taken to preserve these varieties. Other committee reports dealt with the uniform designation of hybrids and inbreds and with the uniform recording of insect damage.

1026 Josephson, L. M. & Stead, B.
Objectives in maize breeding.
Fmg. in S. Afr. 1954 : **29** : 431–34.
Breeding at the Potchefstroom Experiment Station since 1903 is reviewed. Since 1945 promising results have been obtained from hybrids combining the adaptability of local lines with the high yielding character of imported lines, an example being K64 x Synthetic Potchefstroom Pearl. The transfer of the following characters to important inbreds has been undertaken with some success: resistance to *Diplodia* and *Gibberella*, resistance to *Puccinia sorghi*, and a male sterility factor which obviates the need for detasseling during the production of hybrids.
Several lines of sweet corn with improved drought resistance have been obtained.

1027 Jenkins, M. T.
Report of the Ninth Northeastern Corn Improvement Conference held at New York City, New York, March 12-13, 1954 : Pp. 24. (Mimeographed).
Reports are given of maize and sweet corn breeding at the different stations.

Central Experimental Farm, Ottawa
The programme is concentrated upon the development of early maturing strains. Work on male sterility has been initiated.

Connecticut
Pollen-restoring genes from six sources are being transferred to inbreds ranging in maturity from early to late. Some inbreds carry genes capable of restoring fertility to all cytoplasmically sterile lines, others only to certain lines. Some of the larger seed companies now base 20% of their hybrid production on sterile single crosses.

Maine
Field-maize improvement has as its chief aim the breeding of grain types similar to W240 in maturity or earlier. Flint-dent combinations have consistently outyielded early dents and are 10–15% higher in protein and fat content. Early types of sweet corn for processing are being developed.

Maryland
The inbreds obtained from local dents at the Agricultural Experiment Station have proved inferior to the better lines from the Corn Belt. Sweet-corn inbreeding is under way.

Plant Industry Station, Maryland
Progress in the development of lines resistant to *Helminthosporium* blights is reported. The resistance of some inbreds is being transferred to lines with cytoplasmic male-sterility derived from Kys or the Texas strain.

Massachusetts
Inbreds are being extracted from flint varieties at the Agricultural Experiment Station. Early hybrids are required for grain production.
Work is being carried out by the Eastern States Farmers' Exchange, W. Springfield, to improve the husking quality of hybrids. Space between the ear butt and point of origin of the innermost husk favours cleaner husking; one inbred in which this distance was approximately 2 inches has been found.

New Hampshire
Hybrids have been tested for silage production.

New Jersey
Work on cytoplasmic sterility is in progress. Facilitated by this property, some seed production of hybrid NJ7 is planned for 1954. In sweet-corn breeding for lines with better seed quality convergent improvement has given results more rapidly than ear-to-row selection.

New York
A new series of back-crossed inbreds is ready for evaluation. Early-maturing hybrids ripening sufficiently well for crib storage are required. The practical value of short-growing lines is being explored. Cytoplasmic male sterility is being introduced into standard inbreds. Seed production of Cornell M4 (Oh. 51A x B8) x (NY3 x D50), utilizing such sterility, is being planned.

Brookhaven National Laboratory
The mutational effects of γ irradiation are under investigation. The possibility of inducing mutations for resistance to *H. turcicum* by thermal-neutron treatment is being explored.

Ohio
Sterile single-cross seed is available for commercial double-cross production. Work is being carried out on the isolation and identification of pollen-restoring genes; the open-pollinated variety Woodburn contains an appreciable number of such genes. The single cross W22 x Oh. 28 imparts some degree of bird resistance to double crosses.

Pennsylvania
Cytoplasmic sterility is being incorporated in standard inbreds. The evaluation of water requirements of inbreds and hybrids is receiving considerable attention, in relation to general field performance. Three blight-resistant synthetics are being further selected for plant characters prior to distribution.

West Virginia
Inbred lines adapted to the higher altitudes are being developed from local open-pollinated varieties, possibly for the production of synthetics instead of double crosses.
In the discussion on mutation and maize breeding, W. R. Singleton commented upon investigations at the Brookhaven National Laboratory. In the section on diseases, C. C. Wernham reported that evidence of heritable differences in susceptibility to crazy top had been obtained among inbreds; susceptibility to target spot apparently depends upon a single recessive gene.
The plans for the uniform tests of crosses belonging to different maturity groups are summarized. The report of the committee on sweet-corn investigations provides some information on tests carried out in 1953.

1028 Jenkins, M. T.
Final Report of the Corn Improvement Conference of the North Central Region. Fourteenth meeting held at Chicago, Illinois, March 4-5, 1954 : Pp. 34. (Mimeographed).

In the discussion on cytoplasmic sterility in maize, reports of investigations in progress at the different agricultural experiment stations were presented. The Kys and Texas cytoplasmically sterile lines are being widely used in breeding. Additional sources of sterility are being extracted from open-pollinated varieties such as Reid Yellow Dent and Synthetic A. Several inbreds with good pollen-restoring ability have been identified. Line Ia. 153 carries two complementary genes for this capacity. Sterile single crosses are being employed to a considerable extent in the commercial production of hybrid seed in Illinois; two sterile single crosses are in commercial use on a limited scale in Indiana. Cooperative tests of sterile single

crosses and their normal counterparts are being planned.

G. F. Sprague opened the discussion on corn quality and chemistry by an account of investigations at the Iowa Station. He referred to work in connexion with the development of strains with high amylose content, high oil content or improvements in protein content and protein composition.

M. M. Hoover described the work of the Primary Plant Introduction Centre at Ames, Ia., in the preservation of maize germplasm. Information is given on addition to earlier tests of material considered to merit preservation.

A. J. Ullstrup gave a report of breeding for resistance to *Helminthosporium* leaf blight at Purdue, Ind. The resistance of line Mo. 21A has proved to be a valuable source of resistance in different types of combinations.

Other topics discussed included (1) the problem of plant densities in yield trials and (2) trials of reaction to borer and blight. The reports of the committees on uniform tests of lines and hybrids belonging to different maturity groups are also given. Among the matters referred to in the report of the committee on cytoplasmic sterility was the need for a uniform system of designating sources of cytoplasmic sterility and pollen-restoring genes.

1029 **Tomorrow's hybrid corn.**
What's New Crops Soils 1954 : **7** : No. 2 : 12–16.

Some leading American maize breeders comment on the improvements and innovations expected in hybrids developed in the United States during the next decade.

1030 Griffing, B. & Lindstrom, E. W.
A study of the combining abilities of corn inbreds having varying proportions of corn belt and non-corn belt germ plasm.
Agron. J. 1954 : **46** : 545–52.

Three groups of material, each represented by three inbreds, were used in the above investigation at the Iowa Agricultural Experiment Station: (1) "cycled" lines (cf. *PBA*, Vol. XI, Abst. 537), containing only germ plasm from maize of the US corn belt; (2) acclimatized lines developed entirely from Brazilian material; and (3) exotic lines (E) comprising reselections obtained by outcrossing corn-belt inbreds to different Mexican varieties. Data from the nine inbreds and all possible F_1 hybrids indicated that in two of the E lines replacement of 25% and 50% of the corn-belt germ plasm respectively led to an increase in general combining ability for yield, without any marked adverse effect upon agronomic characters such as the production of a large single ear per plant, date of anthesis and shelling percentage.

1031 Shank, D. B., Kratochvil, D. E. & Nachtigal, G. E.
South Dakota corn performance tests, 1952.
Circ. S. Dak. agric. Exp. Sta. 1953 : No. 97 : Pp. 20.

Kratochvil, D. E. & Shank, D. B.
South Dakota corn performance tests, 1953.
Ibid. 1954 : No. 101 : Pp. 20.

The results of trials carried out on maize hybrids and varieties at several centres in South Dakota during 1952 and 1953 are surveyed.

1032 Sentz, J. C., Robinson, H. F. & Comstock, R. E.
Relation between heterozygosis and performance in maize.
Agron. J. 1954 : **46** : 514–20.

Using populations from two crosses, five levels of heterozygosis were studied in relation to performance: (1) inbred parental lines, 0% heterozygosis; (2) F_1 single-cross, 100%; (3) F_2 obtained by selfing F_1, 50%; (4) second back crosses, 25%; and (5) double back crosses, 75% heterozygosis. Data were obtained on ear yield, plant height, ear height, ear number, ear length and diameter, and maturity. Except for ear number, the relationship between heterozygosis and performance was curvilinear, indicating the interaction of nonallelic genes. The quadratic relationship obtained in the case of ear number showed that hybrid vigour for yield cannot be solely accounted for by increased number of ears. Although statistically significant differences could not be established, the data suggested that the first back cross was superior to the F_2 with respect to some characters; no satisfactory genetical explanation of this superiority could be offered. Variability was expressed in the heterozygosis-performance relationships under different environmental conditions; sources of experimental error resulting from differences in various environmental factors are discussed.

1033 Mazoti, L. B.
Caracteres citoplasmáticos heredables derivados del híbrido de "*Euchlaena*" por "*Zea*." (**Heritable cytoplasmic characters derived from the hybrid of *Euchlaena* with *Zea***).
Idia 1954 : No. 77 : p. 12. (Abst.).

Influence of the cytoplasm of the two genera was observed in respect of ear yield, earliness,

the expression of the iojap type of variegation, and heterosis. The Old-gold, Fine-stripe and Japonica types of variegation and the Golden and Albescent types of chlorophyll deficiency were not affected.

1034 Mazoti, L. B.
Variación citoplasmática heredable y su reversión por acción de genes simples en maíz. (**Heritable cytoplasmic variation and its reversion by the action of simple genes in maize**).
Idia 1954 : No. 77 : 12–13. (Abst.).

The fact that the *ij* gene in chromosome 7 reverts to its normal state under the influence of the gene *R* in chromosome 10 suggests various possibilities of utilizing genic and cytoplasmic diversity for the purpose of crop improvement.

1035 Dollinger, E. J.
Studies on induced mutation in maize.
Genetics 1954 : **39** : 750–66.

Most of the recessive mutations induced at the loci *Yz*, *Lg* and *Gl* by X irradiation of the mature pollen were the result of chromosomal alterations involving loss of the locus concerned. Using a homozygous a_1dt stock, the dominant flush pattern of anthocyanin pigmentation was found in the endosperm of 2% of the kernels resulting from fertilization by X-irradiated pollen; most of the affected kernels were germless. Treatment of developing kernels homozygous for a_1dt with chronic γ radiation also induced the dominant flush pattern in the endosperm. In addition, a mottled brown type of aleurone was produced. Both these types of endosperm pigmentation were heritable. Attempts to obtain recessive mutation by γ irradiation of premeiotic cells met with some success in the case of the loci A_1 and *Bt* but not *R*, A_2 or *Pr*. Exposure of premeiotic cells of plants homozygous for a_1dt to γ radiation was largely ineffective as a method of inducing dominant mutation.

1036 Musiĭko, A. S.
(**New maize varieties for silage**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1954 : No. 4 : 14–17. [Russian].

Gruševskaja Odesskaja [Odessa Gruševskaja], a new silage variety selected from a mixed population of the Moldavian varieties Moldavka, Gruševka and Gruševskaja Mestnaja [Local Gruševskaja], outyielded VIR 42 [Plant Industry 42] by 135 c. of green matter per ha. in recent trials on irrigated land in the Odessa province. Odessa 10 gives even higher yields of green matter, in addition to producing good yields of grain. It was obtained by pollinating Liming Kubanskiĭ [Kubanj Leaming] with a pollen mixture consisting of pollen from the varieties Dnepropetrovsk and Minnesota 13 Extra, as well as self pollen. Its ears weigh 430–600 g. and the 1000 grain weight is 375 g.

1037 Kidd, H. J. & Reynolds, H. C.
"Some peculiarities of maize in Asia" by N. N. Kuleshov.
Ann. Mo. bot. Gdn. 1954 : **41** : 271–99.

Except for the omission of the literature review of American studies on waxy maize, the Russian text of a paper by N. N. Kuleshov [Kulešov] on the above subject is translated in full from *Trud. priklad. Bot. Genet. Selekc.* (*Bull. appl. Bot. Gen. Pl.-Breed.*) 1928 : **19** : 325–74. This account of collections from different regions in Asia is of particular interest in view of recent work on the geography of races of maize.

1038 Sarria Villano, D.
Estudio descriptivo de cuatro razas de maíz en Colombia. (**Comparative study of four maize races in Colombia**).
Acta agron. 1954 : **4** : 161–74.

A statistical study was made of a number of Colombian maize varieties, grouped into races according to morphological and other characters. Descriptions are given of four of these races, with indications of their distribution, probable origin and agronomic features, including reaction to *Helminthosporium* and rust.

1039 Straus, J.
Studies on maize endosperm-derived tissue grown *in vitro*; culture requirements, morphology, and cytology.
Diss. Abstr. 1954 : **14** : Publ. No. 7738 : 588–89. (Abst.).

Straus, J.
Maize endosperm tissue grown *in vitro*. II. Morphology and cytology.
Amer. J. Bot. 1954 : **41** : 833–39.

A tissue derived from the endosperm of maize was successfully grown *in vitro*. The mature cells of the tissue were frequently multinucleate or polyploid and often contained highly lobed nuclei; many bridges and laggards were observed in dividing cells. Some of these abnormalities were possibly due to the action of the nucleic acids present in the yeast extract included in the culture medium.

1040 Wellhausen, E. J. & Prywer, C.
Relationship between chromosome knob number and yield in corn.
Agron. J. 1954 : **46** : 507–11.

Investigations were carried out in Mexico to study the relationship of knob numbers in inbred lines of 25 varieties to top-cross yields. Among inbreds developed at 5000 ft. from varieties adapted to elevations of 4500–6000 ft., those with a higher knob number tended to show the best combining ability, but among inbreds developed at 7500 ft. from varieties adapted to altitudes of 6500–7500 ft., those with lower numbers of knobs were better combiners than lines with higher numbers. It is suggested that introgression by *Tripsacum* and teosinte has affected the relationship between knob number and combining ability. Since in Mexico *Tripsacum* is primarily a tropical genus, natural or artificial selection at high altitudes would tend to reduce the numbers of knobs derived from this source.

1041 Rabideau, G. S.
Amino acids in the embryo and endosperm of the grain of different varieties of corn.
Bot. Gaz. 1954 : **115** : 391–94.

The embryos and endosperm of ten varieties, involving flint, dent and popcorn types, were analysed for free and combined aminoacid contents. Free aminoacids existed in very small amounts in the embryos; most of the aminoacids were present as protein. Inter-varietal differences in the proportions of the individual aminoacids were not conspicuous.

1042 Kuo, C.-Y.
Inheritance of and interrelationships of tryptophan, niacin, protein, and kernel weight in corn.
Diss. Abstr. 1954 : **14** : Publ. No. 7162 : 433–34. (Abst.).

Investigations were carried out on 60 inbreds of maize and two crosses, W23 x R53 and W23 x Oh51A. The inbred lines showed marked differences in niacin and tryptophane content; several had high concentrations of both. Relationships involving kernel weight and tryptophane, niacin and protein contents, as shown by the data from the two crosses, were in general not of sufficient magnitude to be of value in breeding. In both crosses, high niacin content was dominant over low. Higher kernel weight showed no dominance in W23 x R53; in W23 x Oh51A heterosis affected kernel weight or dominance was complete for large kernels. The numbers of genes responsible for tryptophane and niacin contents were estimated to be low.

1043 Psareva, M. M.
(Pollen viability and the receptivity of the stigmas in maize).
Agrobiologija (Agrobiology) 1954 : No. 4 : 118–20. [Russian].

At Voronež, ripe pollen remained viable when kept for 12 hours under laboratory conditions and the stigmas were receptive to pollen for three days after the inflorescences reached maturity.

1044 Galinat, W. C.
Corn grass. II. Effect of the corn grass gene on the development of the maize inflorescence.
Amer. J. Bot. 1954 : **41** : 803–06.

The gene (*Cg*) responsible for the corn-grass mutant causes an alteration in the development of both the functional and rudimentary structures characteristic of the inflorescence of normal maize (cf. *PBA*, Vol. XXV, Abst. 282). The inflorescences of the mutant differ from those of ordinary maize by (1) spathes subtending the spikelets, (2) pistillate spikelets borne singly, (3) two caryopses for each spikelet, (4) a noncompact form characterized by rachis segments arranged in whorls or short spirals, and (5) narrow prophyll-like cupules on the slender pistillate rachis. The evidence from corn grass supports the view that basically the phyllotaxy of the maize inflorescence is whorled rather than spiral.

1045 Linder, R.
Étude d'un caractère héréditaire instable chez le mais: l'épi biparti. (**Study of an unstable hereditary character in maize: the bipartite ear**).
Ann. Inst. nat. Rech. agron., Paris 1954 : Sér. B : **4** : 197–207.

The occurrence of a mutation in which a vertical strip devoid of grain is present on each of the two faces of the cob is described. Some of the progeny of the aberrant plants, which were discovered in an experimental field of the Institute of Botany, Strasbourg University, produced spiral cobs and other distorted forms. The mutant is believed to be a homozygous recessive.

1046 Nelson, O. E. (Jun.) & Postlethwait, S. N.
Variations in atypical growth in a maize mutant.
Amer. J. Bot. 1954 : **41** : 739–48.

"A new semi-dominant mutation in maize, polytypic ear (*Pt*), has a profound effect on the development of the ears. Ears from heterozygous plants typically show a proliferation of

pistillate tissue from the secondary floret. Expression is variable both with regard to the number of florets involved and the extent of the proliferation. Ears from apparently homozygous *Pt* plants show such effects as the proliferation of pistillate tissue from both florets; the proliferation of spikelet parts other than the pistils; and elongation along the main axis of the ear together with all degrees of developmental inhibition of the alicole meristems. The development of the staminate flowers may or may not be influenced by this gene. Where several phenotypic expressions are found on one ear, the more severe are always acropetal to the less severe. This has been interpreted as the result of the attainment by the genic product of a threshold at a given stage in the development of the ear and hence its action on spikelet and alicole meristems of different stages of development. The time at which such a threshold is achieved is determined by whether a plant is homozygous or heterozygous for the gene and by genetic modifiers." [Authors' summary].

1047 Brink, R. A.
Very light variegated pericarp in maize.
Genetics 1954 : **39** : 724–40.

The very light variegated type of pericarp, which arose as a mutant of the light variegated type, contains two doses of transposed modulator, *tr–Mp*, whereas the light variegated type has only a single dose (cf. *PBA*, Vol. XXIV, Abst. 2939 and Vol. XXIII, Abst. 1171). A single dose of *tr–Mp* has been found to reduce the frequency of somatic mutation of P^{vv} to P^{RR} for red pericarp and cob, by 59·7%, when compared with the medium variegated type lacking *Mp*. Compared with one dose of *tr–Mp*, two doses caused a 86·8% reduction. The somatic mutations scored affected the whole kernel, one half or one quarter of the kernel. Whether present in single or double dosage, *tr–Mp* was not associated with any late-occurring mutations of P^{vv} to P^{RR}, expressed as a diffuse type of pigmentation rather than as sectoring. The behaviour of *Mp* is discussed in relation to similar determinants, such as *Ds* and *Ac*.

1048 Dollinger, E. J. & Singleton, W. R.
Cytogenetic analysis of a spontaneous pre-meiotic mutation in maize.
J. Hered. 1954 : **45** : 223–24.

The spontaneous occurrence of a premeiotic mutation of *R* to *r* is reported, the locus *R* being one of the complementary loci necessary for the development of anthocyanin in the aleurone of the endosperm. The mutation was autonomous and stable.

1049 Singleton, W. R.
The effect of chronic gamma radiation on endosperm mutations in maize.
Genetics 1954 : **39** : 587–603.

Investigations were carried out on recessive mutations induced, chiefly in the male gametophyte, by chronic γ radiation from Co^{60}, in dominant genes affecting endosperm characters. The four loci studied most intensively were *Su*, *Pr*, *Sh* and *R*, situated on chromosomes 4, 5, 9 and 10, respectively. The relationship between mutation rate and dosage was non-linear, with a disproportionate increase in the rate as higher doses were employed. Data on the coincidence of mutations in endosperm and embryo suggested that mutation usually occurred at or after the division of the generative nucleus of the irradiated pollen grains. Premeiotic mutations represented less than 1% of the total number. The locus *Wx* is useful in detecting premeiotic mutation, since *wx* pollen grains can be detected by a reddish brown coloration when stained with iodine solution, in contrast to the blue stain of *Wx* pollen; unless the mutation occurred in the grain before sufficient starch had accumulated the normal reaction would be obtained. The particular problems involved in the study of mutations induced by chronic radiation and the advantage of this type of treatment are discussed.

1050 Leng, E. R.
Effects of heterosis on the major components of grain yield in corn.
Agron. J. 1954 : **46** : 502–06.

Using a large number of inbreds and their F_1 hybrids, investigations were carried out at the Illinois Agricultural Experiment Station to determine the effects of heterosis upon total yield and the following yield components: number of ears per 100 ear-bearing plants, weight of grain per ear, 100-kernel weight, number of kernels per ear, number of kernel rows and kernel number per row. Superiority over the parent with the higher value for a given character was used as the criterion of heterosis. The F_1 hybrids displayed marked superiority over their respective "top" parents in the mean values for total grain yield, weight of grain per ear, kernel number per ear and kernel number per row. The hybrids exceeded the appropriate parents in mean kernel weight

by a small but highly significant margin, were almost identical with their top parents with respect to mean kernel row number and were significantly inferior in number of ears per 100 ear-bearing plants. No consistent relationship was found between the yield of an inbred line and the degree of heterosis in the yields of its F_1 hybrids. In general, hybrids involving one or both parents possessing a mean kernel-row number above 18 did not show heterosis for this character, whereas hybrids derived from parents with a row number of 16 or less exhibited a significant amount of heterosis. It is suggested that more than one genetic system controls kernel-row number.

1051 Hooker, A. L.
Relative pathogenicity of *Pythium* species attacking seedling corn.
Proc. Iowa Acad. Sci. 1953 : **60** : 163–66.
Nine species of *Pythium* tested at the Iowa Agricultural Experiment Station, Ames, were found to differ considerably in their degree of pathogenicity. Varietal differences in the susceptibility of the maize lines tested were also observed. Most, but not all, of the *Pythium* species tested proved more virulent at low than at high temperatures.

1052 **(At the USSR agricultural exhibition).**
Zemledelie (Agriculture) 1954 : No. 9 : 8–12. [Russian].
New varieties of cereals on display at Moscow include the maize Krasnodar 1/49, which possesses resistance to smut and maintains heterosis for several generations. It consists of a population comprising strains of four unspecified double crosses.

1053 Reyes, G. M.
An epidemic outbreak of the maize rust in eastern and central Visayas, Philippines.
Philipp. J. Agric. 1953 (1954) : **18** : 115–27.
Philippine varieties of yellow flint maize are less susceptible than Philippine white flint varieties to *Puccinia sorghi*, the most susceptible being Cebu White Flint.
Germination, vigour and yield of seed from rust-infected inbred plants were poor. It is presumed that some of the improvement in rust resistance noted in the next generation was due to the effects of inbreeding and selection.

1054 Ullstrup, A. J.
***Helminthosporium* diseases on corn.**
Plant Dis. Reptr. 1954 : Suppl. No. 228 : 118–19. (Mimeographed).
Little resistance to *H. turcicum* is present in commercially grown hybrids in the Corn Belt. The lines NC34, Mo21A, L97, Ky114 and C123 have been used as sources of resistance, a relatively large number of genes being involved. Resistance to *H. maydis* is apparently determined by several genes. Among the most resistant inbred lines of the Corn Belt are C103, Tr, Os426 and MoG.
Resistance to race I of the two races of *H. carbonum* is determined by a single dominant gene. Resistance to the less virulent race II appears to be governed by several genes.

1055 Pate, J. B. & Harvey, P. H.
Studies on the inheritance of resistance in corn to *Helminthosporium maydis* leaf spot.
Agron. J. 1954 : **46** : 442–45.
Experiments on inbreds, single crosses and selfed progenies from back-crosses at the North Carolina Agricultural Experiment Station indicated that several genes determined resistance to *H. maydis*. The data from the single crosses indicated that in general resistance was partially dominant to susceptibility. The reaction of back-cross progenies involving inbred NC18, however, indicated that this line carried dominant factors for resistance. Possible transgressive segregation in a number of populations suggested that factors for resistance may be additive or complementary.

1056 Roane, C. W.
Genetic variation and cytology of *Helminthosporium carbonum* Ullstrup and the importance of the pathogen in the development of disease-resistant maize.
Diss. Abstr. 1954 : **14** : Publ. No. 7261 ; p. 579. (Abst.).
Monoconidial isolates of *H. carbonum* race I showed considerable genetic variation in morphological and cultural characters but no variability in pathogenicity. It was concluded that *H. carbonum* is heterocaryotic and that the heterocaryons originate through mutation. The mycelial cells contained from 0 to 8 nuclei. By applying inoculum of *H. carbonum* to young plants it has been possible to select for resistance by the time of pollination. The recessive gene *hm* determined the susceptibility of the inbreds K44, H7 and Mp1 to race I; this gene was already known to control susceptibility in some other inbreds. It appeared, however, that *hm* was linked with one or more genes having a lethal effect in certain gametic or zygotic combinations.

1057 Herd, G. W.
Hybrid maize disease resistance tests. Progress report, 1953-54.
Rhod. agric. J. 1954 : **51** : 371–74.

Further tests were carried out on the resistance of open-pollinated varieties, inbreds and single and double hybrids to leaf blight (*Helminthosporium turcicum*) and rust (*Puccinia sorghi*) at the Salisbury Agricultural Experiment Station, S. Rhodesia. Some of the inbreds tested for the first time displayed a promising tendency towards resistance to both diseases. The inbred N3–2–3–3 was again outstanding for its resistance to blight; the good resistance of inbreds A5–7–6 and A2–5–2 to rust was also confirmed.

1058 Hooker, A. L.
Relative efficiency of various methods of inducing field infections with *Helminthosporium turcicum* and *Puccinia sorghi*.
Plant Dis. Reptr. 1954 : **38** : 173–77. (Mimeographed).

Prior to the commencement of breeding maize for resistance to *H. turcicum* and *P. sorghi* at the Iowa Agricultural Experiment Station, data have been obtained on the relative efficiency of different techniques of inducing field infections. Pulverized leaves infected with *H. turcicum* applied to the leaf whorl two or three times resulted in the highest degree of leaf blight. Hypodermic inoculations with *P. sorghi* were superior to other treatments in which liquid spore-suspensions were employed. In the disease nursery to be established, susceptible spreader-rows will be inoculated hypodermically with this fungus; reliance will then be placed on the natural spread of the disease.

1059 Leiderman, L.
Observações sôbre a suscetibilidade de cinco variedades de milho ao ataque de *Heliothis obsoleta* (Fabr., 1793), e *Diatraea* sp. **(Observations on the susceptibility of five maize varieties to attack by *H. obsoleta* (Fabr., 1793) and *Diatraea* sp.).**
Biológico 1954 : **20** : 73–77.

An investigation of varietal susceptibility to the above pests was made at the Campinas Biological Institute, the varieties being laid out in a randomized block design. The variety most resistant to both pests was Cristal.

1060 Melhus, I. E., Painter, R. H. & Smith, F. O.
A search for resistance to the injury caused by species of *Diabrotica* in the corns of Guatemala.
Iowa St. Coll. J. Sci. 1954 : **29** : 75–94.

Three hundred and ten varieties and strains of maize were tested for their reaction to *Diabrotica* spp. during the period 1947 to 1952 at the Iowa State College—Guatemala Tropical Research Center, Antigua, Guatemala. Most of the entries were collected in that country. Eighteen of them exhibited some degree of resistance; with one exception, these belonged to the *giganteum* group. As exemplified by the variety 92A, resistance was heritable, being maintained in the I_2 and I_3 generations. The resistance of this variety was transmitted in three-way hybrids with the susceptible US single-cross (187–2 x L317).

BARLEY

1061 Hsi, C. H. & Lambert, J. W.
Inter- and intra- annual relationships of some agronomic and malting quality characters of barley.
Agron. J. 1954 : **46** : 470–74.

Fifty F_5 and the corresponding F_6 lines from ten crosses were studied to determine the relationships between and within the two generations with respect to 13 agronomic and malting properties (cf. *PBA*, Vol. XXIII, Abst. 2677). The high correlations obtained between the two generations for ear density, date of heading and diastatic power suggest that effective selection for these characters can be made within lines in early segregating generations. Lower inter-annual correlations were obtained for average kernel weight, general fertility and the remaining characters; selection for these is most likely to be effective on a progeny-mean basis. Within each generation the following positive significant relationships were detected: average kernel weight was correlated with yield per acre, bushel weight and extract, yield was correlated with bushel weight and extract, bushel weight with extract, barley protein with diastatic power, and ear density with general fertility. Significant negative correlations within each generation were found between uniformity of kernel weight and yield, yield and date of heading, protein and extract, and between diastatic power and extract. Partial correlations involving kernel weight and the quality properties were essentially similar in magnitude to the corresponding simple correlations, except

that no association was obtained between diastatic power and extract.

1062 Ehrenberg, L. & Gustafsson, Å.
The effects of ionizing radiations in barley.
Acta radiol., Stockh. 1954 : **41** : 101–04.

The results of investigations in Sweden and elsewhere on the biological effects of ionizing agents employed to produce useful mutants in barley are summarized under the following main headings: (1) the effects of ionization upon the cytoplasm, nucleus and chromosomes of cells in the treated grain; (2) the occurrence of lethal and semilethal mutations; (3) seedling growth, rate of survival and incidence of sterility; and (4) hereditary changes transmitted to succeeding generations (cf. Absts. 157–8).

1063 Åsander, F.
Förädling av tidigt sexradskorn för Norrland. (**Breeding early 6-rowed barley for Norrland**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 191–97.

The main aims in breeding a 6-rowed barley for Norrland, Sweden, are early ripening, high yield and grain quality, strong straw, disease resistance and reliability as regards productivity. The breeding programme is based on selection from (1) land races; (2) progeny from intervarietal crosses; and (3) X-ray mutants, from which new material for various hybrid combinations has been obtained in recent years. By such means Dore, Åsa and Edda I and II were obtained.

At present barley breeding at the Jämtland Station is concerned with work on (*a*) crosses in which Edda, Åsa, Vega and Asplund have been used as parents; and (*b*) X-ray mutants of Åsa and Edda II.

One high yielding, stiff-strawed line from Asplund x Edda II approximates to Åsa in earliness and is being multiplied by the General Swedish Seed Co.

1064 Taylor, L. H. & Atkins, R. E.
Effects of natural selection in segregating generations upon bulk populations of barley.
Iowa St. Coll. J. Sci. 1954 : **29** : 147–62.

Bulk populations of 20 crosses were grown for one to three generations at several centres in Iowa. Seed of each generation from the different localities was then grown in bulk-hybrid tests at two of the centres in 1950, data on grain yield, plant height and maturity being obtained. Yield tests of F_5 selections derived from the F_3 bulk populations of the 20 crosses were also carried out at the same two centres and in the same year. The locality in which the segregating generations had been grown significantly influenced the yield and maturity of subsequent bulk populations but had no effect upon height. Seed weight was significantly associated with yield in the bulk-hybrid tests. Crosses that were high yielding in these tests tended to produce the greatest proportion of high-yielding selections. The yield data from the bulk populations could have provided a basis for screening entire crosses. It is concluded that the predictive value of bulk-hybrid tests depends upon the locality in which they are performed and upon the magnitude of the selection pressures during the particular years of testing; wide fluctuations in disease or climatic conditions during the growth of the segregating populations tend to make bulk tests unreliable as a basis of selection. Bulk-hybrid trials may however provide valuable information if conducted for several seasons comparable with respect to growth conditions.

1065 Frey, K. J.
The use of F_2 lines in predicting the performance of F_3 selections in two barley crosses.
Agron. J. 1954 : **46** : 541–44.

F_2 derived lines from Stewart x Bay and Kindred x Bay and F_3 derived lines from random selections made within the F_3 progenies of the F_2 selections were studied with respect to yielding ability, test weight, heading date and plant height. The term F_2 (or F_3) derived line refers to a strain originating from a single F_2 (or F_3) plant irrespective of the generation in which it was tested. The performance of the F_2 derived lines gave a good indication of the performance of the F_3 derived lines, heading date and height being the most and yield the least predictable. A scheme of breeding is proposed in which selection is practised only between F_2 derived lines, final selection being made within superior F_2 derived lines in the F_6–F_{10} generations. A considerable amount of the time and labour involved in pedigree selection would thus be eliminated so that more crosses or a greater number of selections from one cross could be evaluated.

1066 Modilevsjkiĭ, Ja. S.
[**The fertilization of barley (*Hordeum sativum*) in connexion with studies of the modes of fertilization in angiosperms**].
Bot. Ž. (Bot. J.), Kiïv 1953 : **10** : No. 2 : 13–31. [Ukrainian].

A detailed description of double fertilization in barley, with notes on the varied location of the

polar nuclei within the embryo sac and morphological variability in male sex cells from the same pollen tube is given. Neither polyspermy nor cytoplasmic interaction between the parental cells occurred.

1067 Takahashi, R.
(Studies on the inheritance and linkage of sensitivity to light in barley).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 258–59. [Japanese].

The genetics of earliness induced by increased temperature and long photoperiods was studied in a cross between two strains of Iwate Menshuri 2. Induced earliness was found to be a recessive character controlled by a gene designated *ls*; this locus is linked with *Hshs* (hairy *v.* glabrous leaf sheath) with a recombination value of 6·4%; it is inherited independently of *Ss* (long *v.* short haired rachilla).

1068 Ueki, K.
(The percentage of natural crossing in Japanese barley).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 37–38. [Japanese].

The frequency of natural cross-pollination was studied in mixed sowings and sowings of alternate rows of different varieties involving the waxy *Hordeum sativum* var. *violaceum* and the starchy varieties Akashinriki [Red Divine Power] and Osakayakko 52 [Servant of Osaka 52]. Cross pollination was detected by treatment of the endosperm with iodine. In mixed sowings of the waxy variety with Akashinriki, cross pollination amounted to 0·061%; no crossing occurred between varieties grown in alternate rows.

1069 **The identification of threshed barley.**
Monogr. Malt Prod. 1954 : Pp. 18.

Following an account of the features used in the identification of barley grains, 15 varieties grown in Britian are described with respect to their grain and other characters. Appendices give (1) a glossary and short bibliographical list, (2) a key to the grain characteristics of the varieties dealt with and (3) photographs of the grains of 12 of the varieties.

1070 Suetsuga, I.
(Morphological studies on the development of the embryo in cereals. II. Barley. 2. Varietal differences in the development of the embryo).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 315–16. [Japanese].

Varietal differences are particularly conspicuous with regard to the following developmental characters: time between anthesis and fertilization, dimensions of the proembryo, stage at which the first leaf rudiment is differentiated, dimensions of the mature embryo, degree of differentiation of the organs composing the embryo, growth of the young shoot and number of seminal roots.

Report of Barley Improvement Conference, Hotel Nicollet, Minneapolis, Minnesota, January 29, 1953 : Pp. 49 + Appendix Pp. 10. (Mimeographed).

1071 *Lejeune, A. J. Barley variety surveys,* 1952. (*pp. 10–12*).

Information on varietal acreages in the 1952 barley crop is provided for five midwestern states.

1072 *Wiebe, G. A. Barley variety tests in the Upper Mississippi Valley barley nursery* 1952. (*pp. 22–24*).

The results of trials on commercial varieties and new selections at 24 centres are summarized. Of the new barleys tested, North Dakota B104 (T–55–3–7) was the highest in yield and fairly satisfactory as regards type. At many stations it was equal to Kindred but at several others was definitely inferior.

1073 *Dickson, A. D. Experimental malting tests on samples of barley grown in the Upper Mississippi Valley in* 1952. (*pp. 24–31*).

Data are given on the malting qualities of named varieties and selections from 15 stations. Studies of isogenic lines have led to two interesting results: (1) smooth-awned and rough-awned counterparts have exhibited nonsignificant differences in malting quality and (2) an orange-coloured lemma is associated with a considerably higher α-amylase activity than the normal type of lemma.

1074 *Burkhart, B. A. Pilot brewing tests on commercial and laboratory malted barley.* (*pp. 32–38*).

The results obtained at the Malt Research Institute, Madison, Wis., from samples of Kindred, Montcalm and Moore, malted both commercially and in the laboratory and then brewed in a pilot brewery, indicated that laboratory malts are satisfactory for evaluating varieties and selections. Work is to be continued to reduce the differences found between the commercial and laboratory malts, such as the higher wort colour of the latter.

Report of Barley Improvement Conference, Hotel Gardner and North Dakota Agricultural College, Fargo, North Dakota, February 11-12, 1954 : Pp. 108 + Appendix Pp. 10. (Mimeographed).

1075 *Sisler, W. W. Barley variety testing and breeding in North Dakota.* (*pp. 3–7*).

The development of selections of malting barley from Kindred x Titan is described in detail, as an illustration of the procedures followed at the North Dakota Agricultural Experiment Station. Preliminary selection for malting quality is applied as early as the F_3. The best lines from the above cross are superior to Kindred in most agronomic characters and have acceptable malting quality but are marred by a lower proportion of plump kernels. Crosses have therefore been made with varieties possessing good kernel properties.

1076 *Lambert, J. W. Barley breeding and testing in Minnesota.* (*pp. 7–8*).

The general problems involved in breeding malting barley are briefly discussed. In addition to the usual methods of breeding, the possibility of inducing stronger strawed variants by radiation and other mutagenic agents is being explored, using Kindred.

1077 *Christensen, J. J. Significance of diseases in barley.* (*pp. 9–11*).

This general account refers to the influence of changes in the varieties grown in causing shifts in the prevalence of diseases and of races of pathogens. Races of *Helminthosporium sativum* capable of attacking Kindred appear to be on the increase.

1078 *Blanchard, G. W. Honor and award to S. T. Lykken, founder of Kindred "L" barley.* (*pp. 11–19*).

Extracts of letters from brewers and maltsters attesting to the value of Kindred are given, as part of the acknowledgement of Lykken's service to the industry in developing this variety on his farm.

1079 *Parker, J. H. The story of Kindred barley.* (*pp. 19–21*).

An account is given of the selection of the stem-rust resistant variety Kindred by S. T. Lykken and of the rapid increase in the commercial production of this barley since its distribution in 1942.

1080 *Moseman, A. H. Some problems and potentials in field crops research.* (*pp. 36–45*).

Mainly with reference to cereals, a discussion is given of new approaches in crop improvement, such as the cooperative international testing of varieties and breeding stocks for disease resistance, the development of a more diverse basis of genetic resistance and radiation-induced variability. Mention is made of the promising results obtained at the Washington Agricultural Experiment Station by using the short-strawed Japanese wheat Norin 10 [Ministry of Agriculture and Forests 10] in crosses with long-strawed commercial varieties. The short-strawed Norin 10 derivatives produce high yields of well-formed heads and remain practically free from lodging. The author concludes with a discussion of some problems of barley production. Research on winter hardiness and disease resistance is being intensified. Attention is drawn to the unsatisfactory performance of the new barley Moore on account of its susceptibility to net blotch and disappointing malting and brewing quality: more adequate evaluation of new varieties is evidently required. Genetic analysis of isogenic lines is giving useful information, especially on linkage relationships among economically valuable characters.

1081 *Wiebe, G. A. Mississippi Valley barley nursery for* 1953. (*p. 59*).

The results of variety trials on named and experimental varieties at 26 centres in the USA and Canada are briefly surveyed. Of the selections tested, several Titan x Kindred derivatives showed promise.

1082 *Dickson, A. D. Malting quality of barley varieties and selections grown in the Upper Mississippi Valley barley nursery in* 1953. (*pp. 60–69*).

The malting properties of 18 varieties and selections grown at stations in the north-central region of the USA are described.

1083 *Burkhart, B. A. Pilot brewing evaluations of some barley selections.* (*pp. 69–82*).

Further data were obtained indicating that laboratory and commercial malts give comparable results in pilot-brewery trials. The results of malting and brewing tests of selections and control varieties grown at different stations in the USA are summarized. Tests were also carried out on isogenic counterparts with blue and white aleurone; the lines were identical in extract yield and conversion time; the blue-aleurone samples were higher in colour and diastatic power. Recently initiated work on small-scale brewing tests, using only 150 g. of malt, has so far given encouraging results.

1084 *Olson, W. J. Research on barley and malt quality.* (*pp. 83–90*).
Research at the Malt Research Institute, Madison, on the various problems involved in the development of more critical methods of evaluating quality is surveyed. One line of investigation consists of the analysis of the relationship between lemma colour and amino-acid content.

1085 *Harris, R. H. & Banasik, O. J. Results from five years of barley testing for quality.* (*pp. 91–94*).
The relative effects of variety, locality and year upon 1000-kernel weight, N content, extract and diastatic power are analysed on the basis of data on Tregal, Kindred, Manchuria, Montcalm and Moore.

1086 *Harris, R. H. & Banasik, O. J. Results from five years of barley testing for quality. Physical and quality characteristics of B–103 and B–104 barleys compared to Kindred.* (*pp. 95–97*).
The results from tests during 1953 at seven centres in N. Dakota indicate that the two Titan x Kindred derivatives, B–103 and B–104, might prove acceptable for irrigated cultivation, in spite of their relatively high percentage of thin kernels, a character which in their case does not appear to have the expected adverse effects upon barley properties.

1087 Gubernator, V. S.
(The new barley variety, Černigov).
Zemledelie (Agriculture) 1954 : No. 12 : 98–101. [Russian].
Distinguished by drought resistance, large grain, compact ears and tall, firm straw, Černigov was selected from Viner at the Nosovskaja breeding station. The grain has good malting properties. In recent trials the new variety outyielded the standards for the Černigov province and showed a higher degree of resistance to loose smut and frit fly.

1088 Moseman, J. G.
Results from studies of entries in the uniform barley powdery mildew nurseries.
Plant Dis. Reptr. 1954 : **38** : 163–66. (Mineographed).
With respect to *Erysiphe graminis* var. *hordei*, information is given on (1) the field reactions of 36 spring barleys at five centres in North America, (2) the field responses of 33 winter barleys at two centres in the United States and (3) the seedling reactions of these barleys to several physiological races. A number of varieties and selections of both spring and winter barley exhibited resistance in all tests.

1089 Haskett, W. C.
Barley scab.
Iowa St. Coll. J. Sci. 1954 : **28** : 331–32. (Abst.).
Isolates of *Gibberella zeae* varied in their pathogenicity on barley seedlings and spikes. Tests were carried out on 628 introductions and 30 named varieties at two centres in Iowa during 1951 and 1952. Fifteen introductions, chiefly of the Manchurian six-rowed type, displayed some resistance to both *G. zeae* and *Helminthosporium sativum*, according to the criterion of percentage of blighted heads. Seventy-five of the introductions scored a blighted-seed percentage of 5% or less for both diseases. The named varieties were all susceptible to both pathogens, Chevron (CI 1111) and Peatland (CI 5267) showing the lowest incidence of blight.

1090 Johnson, T. & Buchannon, K. W.
The reaction of barley varieties to rye stem rust, *Puccinia graminis* var. *secalis*.
Canad. J. agric. Sci. 1954 : **34** : 473–82.
Tests in Canada have indicated that resistance to rye stem-rust is shown by only a very few barley varieties and is largely absent in those barleys possessing resistance to wheat stem-rust. Out of the 270 accessions tested only one, Black Hulless CI666, exhibited a high degree of resistance to rye stem-rust. Only three were moderately resistant: German Brewing CAN 1008, Hanna CI 1122 and *Hordeum deficiens* var. *decorticatum*. The reaction of the seedling leaf to rye stem-rust was found to give little indication of the stem reaction of the adult barley plant. Varietal reactions have therefore to be estimated by tests at the adult stage. Although rye stem-rust is not a threat to barley production at present it constitutes a potential danger; a more intensive search for sources of resistance is therefore to be made.

1091 Dahms, R. G. & Johnson, T. H.
Reaction of barley varieties to chinch bugs.
MS Rep. Abst. Okla. agric. Exp. Sta. 1954 : No. 10 : Pp. 4.
Information on the reaction of approximately 50 barleys to chinch bug in Oklahoma is provided; these varieties proved to be the least susceptible of the total 245 varieties tested. The criteria used in measuring susceptibility were (1) visual injury, (2) number of adult bugs per linear foot, (3) number of nymphs per linear foot and (4) average reproduction per

pair of bugs. Evaluated by all four criteria, Dinar, Besert CI3900, Heron and Vaughn x Stavropol HC34 were relatively resistant; the first two of these varieties are highly resistant to Hessian fly. In general, barleys early or medium in maturity and erect or semiprostrate in type of growth were less susceptible than late-maturing varieties having a procumbent habit.

MILLETS AND SORGHUMS

1092 NAGAMATSU, T.
(Genecological studies on *Echinochloa crus-galli* in rice fields. IV. On variation in the principal characters of *E. crus-galli* from rice fields).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 241–42. [Japanese].

A synopsis is given of the variation in floral and vegetative characters and in heading date observed in a collection of over 800 strains collected in Japan and from abroad, and studied in pots and under field conditions. The relations between the types of variation noted and the original habitats are discussed.

1093 EHARA, K. & ABE, S.
(Studies on *Echinochloa crus-galli* as a weed in rice fields. VI. Classification of the types of *E. crus-galli* occurring in rice fields).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 245–46. [Japanese].

Three main types are recognized: erect, prostrate and intermediate. Classification can also be made on the basis of anthocyanin pigmentation, morphology of the inflorescence, tiller number and heading date.

1094 KARPER, R. E.
Registration of sorghum varieties, VII.
Agron. J. 1954 : **46** : 526–27.

The grain sorghums Redlan (cf. *PBA*, Vol. XXII, Abst. 402), Dwarf Kafir 44–14 (cf. *PBA*, Vol. XX, Abst. 960) and Darset (cf. *PBA*, Vol. XXIII, Abst. 351), recently registered in the USA, are described.

1095 GARBER, E. D.
Cytotaxonomic studies in the genus *Sorghum*. III. The polyploid species of the subgenera *Para-Sorghum* and *Stiposorghum*.
Bot. Gaz. 1954 : **115** : 336–42.

From one to five quadrivalents were observed in pollen mother cells of *S. leiocladum*, *S. australiense* and *S. plumosum*, each of which have $2n = 20$ chromosomes. At least one hexavalent was observed in a strain of *S. plumosum* with 30 chromosomes. It is concluded that all the material investigated is autopolyploid. In *S. leiocladum*, open and zigzag quadrivalent orientations occurred with equal frequency; in the other two species, zigzag configurations predominated. It is thought that the tendency towards zigzag orientation is genetically determined and is independent of the level of polyploidy.

RICE

1096 **World catalogue of genetic stocks. Rice.**
FAO UN, Rome 1954 : Suppl. No. 4 : Pp. 26. (Mimeographed).

This issue contains information on further genetic stocks submitted by breeders in Costa Rica, Egypt, France, India, Japan, Peru, Portugal, Taiwan and the USA (cf. *PBA*, Vol. XXIV, Abst. 1113).

1097 PIACCO, R.
Risi italiani e risi americani. **(Italian rices and American rices).**
Riso, Milano 1954 : **3** : No. 11 : 10–14.

It is pointed out how difficult it is to find an imported rice variety that can vie with the best Italian varieties such as Balilla in yield or Bersani in quality. An outline is given of the rice breeding methods in the USA and of the varieties now in cultivation, from which it is seen that Pearl, the main American variety in the common class, is roughly identical with Balilla, while Zenith, the main variety in the medium class, is very similar to Ardizzone and inferior to Rizzotto; some of the American long rices of the pure *indica* type might be of interest for testing in Italy.

1098 MARUYAMA, M.
Rice culture in Japan.
News Lett. FAO Internat. Rice Comm. 1954 : No. 11 : 21–30.

This general account of rice cultivation in Japan includes sections describing the history and organization of breeding and the methods employed.

1099 COYAUX, Y. ET AL.
Le riz aux États-Unis. Rapport de mission 1951. **(Rice in the United States. Report of the 1951 mission).**
Bull. agron. Fr. d'out. mer. 1954 : No. 10 : Pp. 304.

This report represents the findings of a commission dispatched by the Ministry of French

Territories Overseas to study rice cultivation in the USA. It includes information on varieties grown and breeding work in progress at various research stations in Arkansas, Louisiana, Texas and California.

1100 **World lists of rice breeders and breeding stations.**
FAO UN, Rome 1954 : Pp. 13. (Mimeographed).

Revised lists of rice breeders and their official addresses and of rice breeding stations are provided (cf. *PBA*, Vol. XXIV, Abst. 1114).

1101 PHILLIPS, R. W.
The work of the International Rice Commission—past and future.
News Lett. FAO Internat. Rice Comm. 1954 : No. 11 : 1–10.

The article gives an outline of the activities of the Commission and its working parties from their inception in 1949, and also a discussion of some lines of investigation considered to be worthy of more attention in the future. So far the work of the Commission has been concentrated upon breeding and fertilizer practices.

1102 CHANG, C. W.
Progress report on the work of the International Rice Commission.
News Lett. FAO Internat. Rice Comm. 1954 : No. 11 : 11–16.

The executive secretary of the Commission reviews its work since May 1952, when the third session of the organization was held in Bandung, Indonesia. The activities reported upon include (1) the international instruction courses held on breeding and soil fertility at Coimbatore and Cuttack, respectively, and (2) the international rice hybridization project.

1103 PARTHASARATHY, N.
Report of the International Rice Hybridization Project for the period June 1952 to May 1954.
News Lett. FAO Internat. Rice Comm. 1954 : No. 11 : 17–20.

The programme of hybridization between *indica* and *japonica* types has been extended. The F_1 generations of the different combinations belonging to the initial programme of crossing have displayed varying degrees of spikelet sterility. No significant regional differences in F_1 fertility have been detected. Only a few instances of differential behaviour of parental varieties with respect to F_1 fertility have been found. Evidence has been obtained of a certain amount of lethality of zygotic combinations in most crosses and of reciprocal differences in sterility in some cases. F_2 and F_3 data have indicated that highly sterile F_1 crosses and the more fertile F_1 hybrids give rise to progenies exhibiting a similar range of fertility; sterility does not therefore constitute a handicap in executing the breeding programme. Back-crossing the more sterile F_1 combinations to their respective *indica* parents continued. In meiotic studies of 85 F_1 combinations, pairing was found to be normal except that two or three bivalents in all the cells examined were loosely paired. At anaphase I, laggards, stretched chromosomes, and bridges with fragments were observed; race formation has evidently involved differentiation in chromosomal structure. Highly sterile F_2 and F_3 hybrids exhibited abnormalities at anaphase II. Colchicine-induced *indica* x *japonica* allotetraploids, obtained by treating F_1 seedlings, are to be used in various cytogenetical investigations.

1104 KATAYAMA, Y. & SHIDA, S.
(On mutability in a striped rice).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : p. 108. [Japanese].

An account of the inheritance of leaf pigmentation in the variegated variety Henseiko [Hensei Striped] is given. White stripes in the leaves appear to arise by mutation of highly colour-mutable green plastids. Normal green strains arise by mutation of the colour-mutable plastids to colour-nonmutability. The reverse mutation sometimes occurs but only rarely. Crosses between variegated and green plants display maternal inheritance in respect of plastid type.

1105 KANDA, M. & TAKAHASHI, N.
(Studies on the germination of rice seed).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 176–77. [Japanese].

A comparative study of one quickly germinating variety, Ou 195, and two slowly germinating varieties, Ou 200 and 204, is reported. Rate of germination was correlated with the glycolytic and amylytic activity of the grain.

1106 OKADA, M. & KATO, I.
(On the sensitivity of rice to light. I. On the degree of sensitivity to light of the principal rice varieties of the Tohoku region).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1953 : **22** : 15–16. [Japanese].

The reaction of some 40 varieties to long and to short photoperiods was investigated. The early varieties tended to show the most marked

reactions, especially to long photoperiods. The late varieties were affected most strongly by short photoperiods.

1107 Roy, S. K. & Subramanyam, K. N.
Effect of light exposure on the growth of *japonica* varieties of rice.
J. Indian bot. Soc. 1954 : **33** : 254–58.

Exposure of *japonica* varieties to a natural day-length of approximately 14 hours plus 3 hours' artificial light at the Rice Research Institute, Sabour, Bihar, lengthened the duration of flowering by 13–38 days and in most cases caused marked increases in grain and straw yields. It is concluded that shorter day length is mainly responsible for the reduced performance of *japonica* rices under Indian conditions.

1108 Ito, H., Sano, T. & Takashima, M.
(Experiments on the suitability of rice varieties for rearing in a warmth conservation nursery).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 24–25. [Japanese].

The suitability of 21 Japanese varieties for rearing in nurseries covered with oil paper was investigated. Under these circumstances, inter-varietal differences in stem number disappear. Heading date was advanced most in the medium and late varieties.

1109 Misro, B. & Sastri, S. V.
Peculiar physiological behavior in rice (*Oryza sativa*).
Science 1954 : **120** : 277–78.

In experiments at the Central Rice Research Institute, Cuttack, Orissa, a lower level of nutrient supply, due to a combination of small pot-size and increase in the number of plants per pot, was associated with retarded flowering, contrary to expectation. A maximum difference of 23–27 days in time of flowering was obtained between plants raised individually in 12-inch pots and plants grown in 6-inch pots at the rate of 3 per pot. It is suggested that alteration of flowering time by such means may prove a useful addition to the usual methods employed in crossing period-fixed varieties.

1110 Suetsugu, I.
(Morphological studies on the development of the embryo in rice varieties).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop. Sci. Soc. Japan) 1953 : **22** : 25–26. [Japanese].

Following along the lines of his earlier investigations on other cereals (cf. *PBA*, Vol. XXI, Abst. 2542), the author describes the embryology of some 50 rice varieties and notes varietal differences in such characteristics as number of proembryonic cells 24 hours after anthesis, scutellar morphology, and the structure of the coleoptile and leaf rudiments.

1111 Ikeda, N.
(The genetics of the length of the unhulled rice grain and the influence of the gene concerned on panicle length).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 109–10. [Japanese].

The genetics of grain and panicle length was studied in the F_3–F_5 of Kokuryomiyako x Tairyuto [Large-grained rice]. Both characters are determined by a gene pair denoted *Grgr* whose effect is multiplicative to that of a fundamental gene complex.

1112 Morimoto, I.
(Studies on the productive capacity of rice varieties in Japan. On the number of panicles per plant).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 250–53. [Japanese].

Further to his earlier papers on the yielding capacity of Japanese varieties (cf. *PBA*, Vol. XXIV, Absts. 1130–31), the author provides data on the overall distribution of stem number, which was found to be positively skewed. The relation between the "absolute stem number" of a variety and local and seasonal variations is considered; also the connexion between stem number and yield.

1113 Morimoto, I.
(Studies on the productive capacity of rice varieties in Japan. On the number of panicles per tsubo*).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 286–88. [Japanese].

A distribution curve for the number of panicles per tsubo of the numerous Japanese varieties in the prefectural research stations is presented; the left limb of the curve was somewhat steeper than the right. The varieties with the highest number of panicles per tsubo were Norin 6 [Ministry of Agriculture and Forests 6], Sakae [Prosperity], Kyushu 8, Sembon Asahi and Norin 1. The interaction of variety with local and seasonal conditions in the determination of number of panicles per tsubo is briefly discussed.

* 1 tsubo = 3·31 m.^{2} = 3·95 sq. yard.

1114 Morimoto, I.
(On the concept of relevant circumstances in connexion with correlation coefficients).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 1–2. [Japanese].

Further to his series of articles on the productive capacity of Japanese rice varieties (cf. Absts. 1112 and 1113), the author shows how correlation coefficients involving yield components differ according to year, local conditions and variety.

1115 Morimoto, I.
[On the productive capacity of rice varieties in Japan (contd.). On local correlation coefficients].
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 166–67. [Japanese].

Continuing his analysis of the yield components of Japanese rice varieties (cf. Abst. 1114), the author gives a list of correlation coefficients between heading date, culm length and number of tillers per plant on the one hand and environmental characters on the other. These correlation coefficients are overall figures for all the varieties grown at a single locality. The overall yield of rice at any one locality is positively correlated with culm length, number of panicles per plant, number of panicles per unit area, temperature and certain soil characteristics.

1116 Koršenboĭ, P. G.
(Sixty centners of rice harvested per hectare).
Zemledelie (Agriculture) 1954 : No. 11 : 62–65. [Russian].

The varieties UzROS275 and UzROS269, which have yielded 60·4 c. of grain per ha. on a farm in Uzbekistan, are described. They have an upright habit, are resistant to lodging and shedding, and produce white, semivitreous grain. UzROS275 has a growth period of 130–145 days and ripens 2–3 weeks later than UzROS269.

1117 Altynbekov, A. A.
(High yields of rice).
Zemledelie (Agriculture) 1954 : No. 10 : 54–58. [Russian].

Mention is made of the early Kazah variety Dubovskiĭ 129, which is resistant to lodging and shedding and suitable for combine harvesting.

1118 Tsunoda, S. & Kittaka, A.
(The incidence of withered panicles in rice exposed to a typhoon, together with intervarietal differences. II. On the characters of rice varieties associated with differences in degree of resistance).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 185–86. [Japanese].

In the course of a survey of the incidence of panicle damage in a series of Japanese and introduced rice varieties exposed to a typhoon in 1948, it was noted that resistance was associated with short culm, thick vascular bundles, broad leaves, comparatively low figures for the ratios (*a*) lamina area/weight of water in the underlying tissue and (*b*) number of stomata per unit area, and a reduced tendency for the leaves to roll up when the shoots were cut and left standing in water.

FORAGE GRASSES

1119 **1953 Annual Report of Progress in Forage Crops Research in Oklahoma. Section I. Plant breeding, seed production and technology** : Pp. 46. (Mimeographed).

Andropogoneae. Information is given on the cytology of *Eulalia geniculata*, *Sorghum* spp., *Sorghastrum* spp., *Capillipedium parviflorum*, *Bothriochloa* spp., *Eremopogon faveolatus*, *Dichanthium* spp., *Andropogon* spp., *Cymbopogon bombycinus*, *Hyparrhenia* spp. and *Heteropogon contortus*. Further studies of *Bothriochloa* (= *Andropogon*) *ischaemum* have confirmed the view that the species consists of two types differentiated cytologically, morphologically and geographically (cf. *PBA*, Vol. XXIV, Abst. 1143). Cytological data suggest that polyploidy, hybridization and apomixis have played an important part in the origin of populations of *B. ischaemum*. The chromosome number of *B. radicans* from tropical Africa could not be determined exactly on account of the large number of univalents but is probably $2n = 100$. *Dichanthium annulatum* is represented by both $4n$ and $6n$ forms; this species is believed to be of considerable economic interest. *A. distachyus* had $2n = 36$. In accessions of *Heteropogon contortus* $2n = 40$, 44 or 60.

Sand bluestem (*Eragrostis trichodes*, $2n = 60$) was found to be cytologically regular. Genes for tallness appeared to be mainly dominant. Breeding was continued.

Indian grass (*Sorghastrum nutans*, $2n = 40$) showed normal cytological behaviour. Seeds

and seedlings were treated with colchicine to induce chromosome doubling. Preliminary data suggest that glume colour is controlled by three alleles, one for black being dominant to another for bronze which is in turn dominant to an allele for light straw colour.

Progress is reported in the production of a sweet type of Sudan grass with improved yielding ability, disease resistance and recovery after cutting or grazing.

Panicum. Plant colour in switchgrass is a heritable character but is much influenced by environmental conditions. Plants differ considerably in combining ability. Preliminary results suggest the feasibility of making controlled crosses on excised culms in a cooled greenhouse.

The genetic variation observed in commercial material of blue panic grass offers scope for selection.

Lines of buffalo grass are being studied with respect to their sex ratios and vigour in order to develop a synthetic strain

Other grasses. Breeding work on several species is in progress. The brome-grass variety Southland was released (cf. *PBA*, Vol. XXIV, Abst. 1153).

Medicago. Breeding is concentrated upon the development of improved pasture types. An attempt is being made to incorporate the creeping habit of some Canadian material into adapted types.

1120 **Forage crops evaluation and management studies. Progress report, 1953.**
Mimeogr. Circ. Okla. agric. Exp. Sta. 1954 : No. M–261 : Pp. 30.

A summary is presented of the forage yield trials and observational tests carried out on varieties and strains of grasses and leguminous species at several centres in Oklahoma during 1953 (cf. Abst. 1119).

1121 Hellqvist, H.
Några norrländska övervintringsproblem att lösas av växtskydd och växtförädling i samverkan. (**Some overwintering problems in Norrland to be solved by plant protection and plant breeding combined**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 206–10.

The complicated problem of the overwintering ability of leys and pastures is of special importance for farming in Norrland, Sweden. A substation of the National Plant Protection Institute has been set up at Röbäcksdalen, in collaboration with the substation of the Swedish Seed Association, to study the whole problem of hardiness of forage and pasture crops.

1122 Müntzing, A.
The cytological basis of polymorphism in *Poa alpina*.
Hereditas, Lund 1954 : **40** : 459–516.

Collections of *P. alpina* from northern Sweden and the Öland and Gotland islands were investigated with respect to chromosome number, morphology and breeding behaviour. Additional data were obtained on a smaller number of specimens from Norway, Iceland and Greenland. The chromosome numbers of seed-producing types from northern Sweden ranged from $2n$ = 32 to 50, with 33, 38 and 44 as the most frequent numbers. Material from Gotland consisted chiefly of forms with $2n = 41$ or 33. In specimens from Öland, the more frequent number was $2n = 41$; no samples with $2n = 33$ were found. Collections from the other three countries referred to had a similar range in chromosome number as material from northern Sweden. In viviparous biotypes from northern Sweden, $2n$ = 38–56.

The progenies raised were each uniform except for a very low percentage of plants deviating with respect to morphological characters and chromosome number; apomixis was therefore predominant. The more marked morphological differences between the progenies of the collections were associated with dissimilarities in chromosome number. The material from northern Sweden was divided into 19 morphological groups and a number of biotypes. Biotypes were more numerous from the alpine region than from the subalpine and lowland localities. On the average, alpine biotypes tended to have higher chromosome numbers than those from lower altitudes. Polymorphism in the 41-chromosome form was much more marked in the collections from Öland than from Gotland; probably the biotypes in Gotland were secondarily derived from biotypes with $2n = 41$ from Öland. A positive correlation between pollen fertility and chromosome number was detected, sterility being highest in biotypes with the lower chromosome numbers. One biotype was studied meiotically and exhibited multivalent configurations, its behaviour thus resembling that of the biotypes previously investigated (cf. *PBA*, Vol. X, Abst. 773). Attempts to correlate chromosome number with various morphological characters failed. Identity in chromosome number between forms from different regions indicates a definite

evolutionary relationship. New biotypes possibly have their origins in (1) the occasional sexually-produced aberrants with deviating chromosome numbers, (2) genic mutation and (3) somatic nondisjunction and elimination of single chromosomes.

1123 Håkansson, A.
Transmission of accessory chromosomes in *Poa alpina*.
Hereditas, Lund 1954 : **40** : 523–26. (Abst.).

The parent and hybrid plants examined had accessory chromosomes ranging in number from 2 to 6. Hardly any evidence was obtained of an increase in the number of accessories carried by the hybrids, compared with their parents. Some intraindividual variation in number of accessories was detected. Data on meiosis adequately accounted for the mode of transmission of the accessories. At diakinesis they formed bivalents with one or two terminal chiasmata. Plants with an odd number of accessories generally exhibited a univalent at diakinesis. Lagging at anaphase I did not in most cases result in chromosome loss.

1124 Keller, W.
Water requirement of *Dactylis glomerata* L. in the greenhouse as influenced by variations in technique and their interactions.
Agron. J. 1954 : **46** : 495–99.

With a view to developing a suitable technique to facilitate breeding cocksfoot strains with lower water requirement, experiments were carried out to determine the effects of container, water supply, nitrogen fertilizer, mulch and genotype upon water requirement, and the interactions of these five factors (cf. *PBA*, Vol. XXIV, Abst. 2062). Each factor was represented by two different types or levels. Several significant interactions were obtained, emphasizing the importance of adhering to a single technique of testing. The two genotypes responded differently to both moisture level and mulching.

1125 Nygren, A.
Investigations on North American *Calamogrostis*. I.
Hereditas, Lund 1954 : **40** : 377–97.

The following diploid chromosome numbers are reported: *C. bolanderi*, 56; *C. breweri*, 28, 42; *C. canadensis*, 22–66; *C. crassiglumis*, 140; *C. fernaldii*, 84; *C. inexpansa*, 28, 56, 58, 84–104; *C. koelerioides*, 28, 30; *C. perplexa*, 70; *C. porteri*, 84, 87; *C. purpurascens*, 42–56; *C. rubescens*, 56; and *C. cainii*, *C. densa*, *C. foliosa*, *C. howellii*, *C. montanensis*, *C. nutkaensis* and *C. ophitidis*, 28. In most species, investigations were carried out on meiosis during both microsporogenesis and megasporogenesis and on pollen formation and embryo-sac development. The majority of the North American species are restricted to small areas and are represented by numerically low populations; they are believed to be expiring species. The most successful are *C. canadensis*, *C. inexpansa*, *C. purpurascens* and *C. rubescens*; the first three of these species form diplosporous apomictic strains.

1126 Thomas, H. L. & Kernkamp, M. F.
The use of heritability ratios and correlation coefficients for measuring combining ability with smooth bromegrass, *Bromus inermis* Leyss.
Agron. J. 1954 : **46** : 553–56.

The computation of heritability ratios from polycross progeny tests of *B. inermis* is illustrated, data being given on the magnitude and variability of these ratios in tests carried out at four centres in Minnesota. The view is expressed that heritability ratios are more convenient and useful in the selection of parental genotypes than correlations between parent and progeny.

1127 Lebsock, K. L. & Kalton, R. R.
Variation and its evaluation within and among strains of *Bromus inermis* Leyss. I. Spaced-plant studies.
Agron. J. 1954 : **46** : 463–67.

A study was made of the mean agronomic performance and plant-to-plant variability of three clones and 21 strains in a space-planted nursery at the Agronomy Farm, Ames, Ia. The strains displayed highly significant differences in mean performance and in extent of individual-plant variability with respect to autumn vigour, hay production, height, spread, scoring for leaf disease, leaf width and recovery. The commercial varieties tested (Fischer, Lincoln, Achenbach and Elsberry) and some new strains from the southern region of the United States gave the best all-round performance. Turkish introductions appeared to be potentially valuable for breeding. Phenotypic correlations of hay production with autumn vigour, spread, height and recovery ranged from 0·76 to 0·94. The selections made are being used as material for evaluating the effectiveness of phenotypic selection in the original space-planted nursery and for initiating a programme of recurrent selection.

1128 HITTLE, C. N.
A study of the polycross progeny testing technique as used in the breeding of smooth bromegrass.
Agron. J. 1954 : **46** : 521–23.

Data on the performance of the polycross progenies of 20 clones indicated that a number of clones had been exposed to variation in pollen source in the different randomized replications. In applying the polycross progeny test to determine combining ability, differential pollen effects should therefore be minimized by using a relatively high number of replications.

1129 RAEBER, J. G.
Variation and inheritance of seed fertility and seedling vigor in *Bromus inermis* Leyss.
Iowa St. Coll. J. Sci. 1954 : **28** : 390–91. (Abst.).

Investigations were carried out on S_0 clones, S_1 segregates, and top crosses of S_0 and S_1 plants with the variety Fischer. The clones differed in general combining ability for seedling vigour, although this character was markedly influenced by environmental conditions and was low in heritability. Selection for seedling vigour within and among strains is likely to lead to improvement in this respect. Greenhouse tests of seedling vigour were not satisfactory since control of the environmental conditions was not sufficiently strict. Number of florets is considered to be primarily conditioned by a large number of loci with additive effects. Fertility was apparently determined by both meiotic behaviour and by genes directly affecting fertility. Inbreeding tended to cause decreased fertility. Selection and recombination of strains possessing both vegetative vigour and a high degree of fertility is regarded as feasible.

1130 CARNAHAN, H. L. & GRAHAM, J. H.
Sources of resistance to *Pyrenophora bromi* among species of *Bromus*.
Plant Dis. Reptr. 1954 : **38** : 716–18. (Mimeographed).

In greenhouse inoculations of 19 species of *Bromus* at the US Regional Pasture Research Laboratory, State College, Pa., a high degree of resistance to *P. bromi* was found only in some of the annual weed species. The moderately resistant tetraploid *B. sibiricus* offers the only source of resistance discovered in sect. *Bromopsis*.

1131 WINTERSTEEN, H.
The response of ten clonal lines of *Bromus inermis* to infection by *Selenophoma bromigena*.
Phytopathology 1954 : **44** : 655–56.

Under field conditions at the Iowa Agricultural Experiment Station infection with *S. bromigena* was limited to two or three of the ten clones tested during 1952 and 1953. When tested in the greenhouse, all the lines showed some susceptibility. Five clones displaying only flecking were arbitrarily classed as resistant; they may prove valuable in breeding.

1132 BOSEMARK, N. O.
On accessory chromosomes in *Festuca pratensis*. I. Cytological investigations.
Hereditas, Lund 1954 : **40** : 346–76.

Investigations were carried out on plants collected in natural populations in Sweden and on hybrids between these specimens. The size of the standard accessory was approximately one quarter of the mean for the normal chromosomes. Smaller derivatives of the standard type occurred in low frequencies. Another type of accessory, double the size of the standard, was also observed; its origin was unknown. The accessory chromosomes were highly heterochromatic in the resting and prophase stages. The standard type occupied a more central position in the somatic metaphase-plates than the normal chromosomes. The number of the standard accessories within an individual plant was highly constant. No pairing between accessory and normal chromosomes took place. In plants with more than one accessory per cell, the accessories showed univalent, bivalent and multivalent configurations during meiosis. Univalent accessories divided at anaphase I; in some plants with high numbers of accessories, difficulties in the separation of the dividing univalents led to the formation of restitution nuclei. The degree of meiotic elimination of accessories was low. The accessories frequently underwent nondisjunction at the first pollen mitosis. It is suggested that differences in the internal environment of the cell are largely responsible for the variation in the behaviour of the accessories during meiosis and pollen mitosis.

1133 BOSEMARK, N. O.
On accessory chromosomes in *Festuca pratensis*. II. Inheritance of the standard type of accessory chromosomes.
Hereditas, Lund 1954 : **40** : 425–37.

Investigations were carried out on crosses among parents with various numbers of the standard type of accessory (cf. Abst. 1132). Nondisjunction of the accessories occurred only in the pollen grains. The highest number of accessories obtained in a progeny was 19; because of the

increasing sterility and cytological disturbances associated with increasing numbers of accessories, this number is considered to represent the approximate maximum that can be attained. It is concluded that the general effectiveness of the nondisjunction mechanism in combination with the fairly low degree of meiotic elimination endows the accessories with a fairly good capacity for maintaining themselves and even increasing in natural populations.

1134 DAGRADI, S.
Sul grado di tossicità di alcune razze di sorgo di nuova introduzione. (**The degree of toxicity of some newly introduced varieties of sorghum**).
Ann. Sper. agr. 1954 : **8** : 1685–700.

The HCN content of the hybrid sorghums Norkan and Coes, which were obtained by crossing *Sorghum vulgare* with *S. exiguum* (= *S. sudanense*), proved to be less than the average found in sugar varieties and dangerous to cattle only in very young plants less than 30 cm. high.

1135 HAUSWIRTH, E. A.
El contenido de dhurrina en sorgos forrajeros. Primera comunicación. Efectos de la selección. (**The dhurrin content of fodder sorghums. I. Effects of selection**).
Rev. agron. Noroest. argent. 1954 : **1** : 181–211.

Analyses were made of 14 representatives of *Sorghum almum*, *S. sudanense*, *S. caffrorum* and *S. saccharatum*, using the base of the uppermost outer leaf for the estimation of dhurrin content. The varieties of *S. almum* had higher values than those of the other species and those of *S. caffrorum* lower. In each variety the plants with the lowest dhurrin content were selected in two successive generations, with the result that marked reduction occurred in some varieties of *S. sudanense* and *S. caffrorum*; in *S. almum* no reduction took place and in *S. saccharatum* the effect was doubtful. The reduction in the first generation of selection was much greater than that in the second.

1136 GOPALA IYENGAR, K. & SRINIVASA IYENGAR, G.
A preliminary note on hybrid fodder bajra.
Mysore agric. J. 1954 : **30** : 112–14.

In 1945 a Mysore race of Hullu Sajje (*Pennisetum typhoides*) was crossed with *P. purpureum* in an attempt to combine the tillering habit and good fodder qualities of the former with the vigour and hardiness of the latter. A few fertile seeds were produced by the F_1, and subsequent generations were screened for vigour, tillering capacity and seed setting. In 1951 two types, A and B, were isolated and tested. B was found to be more vigorous, more rust resistant and heavier yielding than A, and stemmy rather than leafy, while A tillers more profusely, is leafy and ratoons well.

1137 KRISHNASWAMY, N. & RAMAN, V. S.
Studies on the interspecific hybrid of *Pennisetum typhoides*, Stapf & Hub. x *P. purpureum*, Schumach. III. The cytogenetics of the colchicine induced amphidiploid.
Genetica 1954 : **27** : 253–72.

Except for the greater size of the pollen grains and stomata and higher pollen and seed fertility, the amphidiploid *P. typhoides* x *P. purpureum* ($2n = 42$) did not show any marked phenotypical differences from the parental F_1 hybrid (cf. *PBA*, Vol. XIX, Abst. 1837). In chemical composition the F_1 hybrid and amphidiploid were similar. During meiosis only bivalents were formed in the amphidiploid. Disjunction bridges and chromosome fragments were observed at anaphases I and II. Tetrad formation was, however, highly regular and pollen fertility was high. The cytological behaviour of the amphidiploid is analogous to that of *Phleum pratense* and conforms to the autoallopolyploid type.

1138 BERHAUT, R. P.
Nouveautés sur les Graminées du Sénégal. (**Newly described Gramineae from Sénégal**).
Bull. Soc. bot. Fr. Mém. 1953–54 (1954) : 9–12.

The following new forms are described: *Echinochloa verticillata*, *Pennisetum pedicellatum* var. *pubirachis*, *Ctenium villosum*, *Panicum tambacoundense*, *P. calocarpum* and *Loudetia bidentata*.

1139 CIALZETA, C. & COVAS, G.
Producción de híbridos comerciales interespecíficos de *Phalaris tuberosa* x *Ph. arundinacea*. (**Production of commercial interspecific hybrids of *Ph. tuberosa* x *Ph. arundinacea***).
Idia 1954 : No. 77 : 5–6.

The F_1 of this cross, which is extremely vigorous but sterile, when treated with colchicine gave rise to a fertile amphidiploid (cf. *PBA*, Vol. XXIV, Abst. 1163) which can be crossed with the parent species. In a plot planted with alternating rows of the two species the seed from *Ph. tuberosa* gave rise to 407 seedlings, of which 315 had pink root tips like *Ph. arundinacea* and were presumed to be hybrids. The total

yield of seed was calculated as being higher than that from commercial seed plots of *Ph. tuberosa* and the proposal is put forward that seed produced in this way should be used for building up clones of hybrid seedlings.

1140 HARVEY, L. H.
New entities in north and middle America *Eragrostis* (Gramineae).
Bull. Torrey bot. Cl. 1954 : **81** : 405–10.

The following five new species are described: *E. yucatana*, *E. glandulosa*, *E. oreophila*, *E. praetermissa* and *E. perplexa*.

LEGUMINOUS FORAGE PLANTS

1141 BINGEFORS, S.
Amerikansk vallbaljväxtförädling. Några intryck från en studieresa i U.S.A. 1952. (**Breeding leguminous herbage plants in America. Some impressions from a study tour in the USA, 1952**).
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 241–60.

The crops, dealt with in order of their importance in this review, are lucerne, red clover, Ladino clover, sweet clover and birdsfoot trefoil. In addition to improvement of yield, the breeding aims discussed include: resistance to nematodes, insect pests, cold and diseases due to fungi, viruses or bacteria; increased seed production; and persistence.

1142 BUYS, A. C.
Iets over de zaaizaadvoorziening van lucerne. (**Concerning the provision of lucerne seed for sowing**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1954 : **11** : 68–69.

Of 68 strains of foreign provenance tested in 1952, the French varieties Du Puits, Flamande Flandria, Flamande Chartainvilliers, Flamande Socheville and Flamande C49 proved the most suitable for cultivation under Netherlands conditions.

1143 DEMARLY, Y.
Étude de l'hérédité de la bigarrure de la fleur chez la luzerne. (**Study of the inheritance of variegated flower in lucerne**).
Ann. Inst. nat. Rech. agron., Paris 1954 : Sér. B. : **4** : 5–20.

Breeding experiments at the Central Station of Genetics and Plant Breeding, Versailles, have shown that the gradual change observed in the colour of the flowers of some lucerne plants from deep purple when the bud first opens to bluish purple or bluish green when the flower is fully developed is a hereditary character, determined on a tetrasomic basis. Two factors, *U* and *B*, are postulated, *U* determining uniform colouring and *B*, when in a dominant state, variegation. The theoretical occurrence of variegation is estimated mathematically and it is concluded that, in any given population, the number of plants with variegated flowers tends towards a characteristic equilibrium.

1144 WHITEHEAD, W. L. & DAVIS, R. L.
Self- and cross-compatibility in alfalfa, *Medicago sativa*.
Agron. J. 1954 : **46** : 452–56.

Six lucerne clones were chosen in 1950 as being representative of different degrees of self compatibility, according to data on the number of pods formed when self-pollinated. The parents, selfed progenies (designated S_1) and F_1 generations of all possible combinations among the six clones were studied under greenhouse conditions during 1952. Within each of these three main groups, significant differences were found for the percentages of pollinated florets forming pods and for number of seeds per pod. Cross compatibilities and also F_1 and S_1 self compatibilities were significantly correlated with the self compatibilities of the maternal parents. Reciprocal differences were noted for parental cross compatibilities and for F_1 self compatibilities, the ♀ parents having a greater influence than the ♂ parents. Differences among the parents in self and cross compatibility were not associated with percentage of viable pollen. It is suggested that some compatibility factors determined both pod number and seed number per pod while others affected one or the other of these characters.

1145 TAKASUGI, S. & DOBASHI, K.
(**Studies on lucerne. I. On the resistance of seeds and young plants to acidity**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1953 : **22** : 137–39. [Japanese].

The injurious effects of acid soils upon the growth of lucerne appear to be due, in part, to the toxic action of Al ions, which delay germination and retard the development of the tap root. The variety Ranger was less susceptible to the action of Al than Japanese material.

1146 MULTAMÄKI, K.
Sinimailaslajikkeiden talvenkestävyydestä. (**On the overwintering of lucerne varieties**).
Koetoim. ja Käytäntö 1954 : No. 6 : p. 21.

A brief account is given of trials carried out at

the Jokioinen Experimental Station, Finland, in the years 1949–50 with several different varieties of lucerne, both native and foreign, to test their capacity for surviving winter conditions. Comparative data are given for overwintering capacity and for yield. Grimm was the most successful foreign variety and was almost equalled by the Danish variety Dæhnfeldt. The variety Jokioinen showed promise in the second year of the experiment.

1147 Roženkov, J. A.
(Pollination of clover seed plots with bees without moving the hives).
Zemledelie (Agriculture) 1954 : No. 6 : 123–24. [Russian].

By conditioning with syrup flavoured with clover flowers and aniseed, bees could be induced to visit a clover field at a distance of 2·3 km.; seed yields were increased from 0·3 to 3·11 c. per ha.

1148 Hawkins, R. P.
Investigations on local strains of herbage plants. III. Strains of doublecut red clover and their identification.
J. Brit. Grassl. Soc. 1954 : **9** : 221–38.

The author has continued his work on British strains of red clover by further investigation of strains of the double-cut type (cf. *PBA*, XXIV, Abst. 1181). The results from trials carried out by the National Institute of Agricultural Botany indicate that although the strains vary in their relative yield in different districts they outyield strains from overseas. Evidence is quoted to show that the agronomic characters of a strain are unlikely to change within a generation or two if the seed is produced in a region other than where the strain is generally cultivated. Mechanical mixture with local strains and intercrossing with such strains are considered to be more likely causes of changes in characteristics than a new environment. Variation in flower colour and the proportion of plants with hairy stems were found to be useful in strain classification. Limited investigations suggest that these characters may also be of value in distinguishing strains of single-cut and late-flowering red clover. Details of the methods of measuring flower colour by means of a Lovibond tintometer and of recording hairiness are given.

1149 Razin, N. S.
(Local red clover varieties).
Zemledelie (Agriculture) 1954 : No. 9 : 99–101. [Russian].

The results of trials of old-established land varieties at the Institute of Flax are given. Some land varieties, including Minskiĭ Pozdnespelyĭ [Late Minsk] and the early varieties Sluckiĭ and Polockiĭ, have recently been made standards in White Russia.

1150 Kovalenko, I. F.
(Local and cultivated varieties of red clover).
Zemledelie (Agriculture) 1954 : No. 8 : 86–91. [Russian].

In White Russian trials, the new early variety Zazerskiĭ, obtained by intervarietal open pollination, outyielded all other strains. It showed resistance to drought and diseases and was hardier than local early varieties.

1151 Daday, H.
Gene frequencies in strains of *Trifolium repens* L.
Nature, Lond. 1954 : **174** : p. 521.

The author has continued his study of the genes for the glycoside lotaustralin (*Ac*) and linamarase (*Li*) by an analysis of the frequencies of the dominant alleles in strains of *T. repens* (cf. *PBA*, Vol. XXIV, Abst. 3082). Among the different strains the frequencies of *Ac* and *Li* ranged from 0 to 100% and from 10·5 to 86·3%, respectively. In wild and cultivated strains from the same geographical region the frequencies of *Ac* or *Li* were strikingly similar. British and New Zealand strains had high frequencies, whereas for the Swedish, Danish and north Italian strains the frequencies were generally low. The variation in the frequencies of *Ac* and *Li* in samples from different geographical regions is ascribed to the effect of natural selection.

1152 Symon, D. E.
Heterozygosity in subterranean clover (*Trifolium subterraneum* L.).
Aust. J. agric. Res. 1954 : **5** : 614–16.

At the Waite Institute, Adelaide, a naturalized stand of subterranean clover, consisting mainly of the varieties Dwalganup, Bacchus Marsh and Mt. Barker, was found to contain a number of aberrant seedlings, such as albinos, variegated albinos and lutescent and virescent forms. Under glasshouse conditions some of these were found to breed true, some segregated, while one variegated plant produced green progeny only.
The proportion of aberrant plants in sample quadrats was 0·070%, from which figure it is estimated that 0·0028% of the population is heterozygous for recessive genes determining chlorophyll defects.
Aberrant plants have also been observed in populations of the varieties Clare and Bacchus Marsh, respectively.

1153 Hutton, E. M. & Peak, J. W.
The effect of autotetraploidy in five varieties of subterranean clover (*Trifolium subterraneum* L.).
Aust. J. agric. Res. 1954 : **5** : 356–64.

Colchicine-induced autotetraploidy in the variety Dwalganup resulted in increases of 60 and 65·5% in total dry weight at flowering and maturity respectively, but tetraploids of the other four varieties studied gave decreased yields of dry matter compared with the diploids. The tetraploids and diploids did not differ in percentage moisture content or in time of flowering. Pollen production by both $4n$ and $2n$ plants was abundant. Tetraploidy led to a decrease in the percentage of florets setting seed, the reduction ranging from 25·5% in Dwalganup to 61·4% in Mount Barker. Under greenhouse conditions, the tetraploids displayed a significant increase in early growth but this advantage was only maintained until flowering by Dwalganup.

1154 Hutton, E. M. & Peak, J. W.
Varietal reactions of *Trifolium subterraneum* L. to *Phaseolus* virus 2 Pierce.
Aust. J. agric. Res. 1954 : **5** : 598–607.

The reactions of a number of varieties to inoculation with a severe strain of *Phaseolus* virus 2 are described. Northam First Early, Dwalganup and Pink Flowered give lethal necrotic reactions while the rest show mottle and chlorosis of different intensities. After hand inoculation 10% of the plants from varieties characterized by a lethal reaction were unaffected, while all plants of the varieties with a mottle reaction became systemically infected.

Infection resulted in reductions in fresh weight ranging from 26·1 to 76·7% according to the variety.

In most crosses the lethal reaction was found to be dominant.

1155 Berkner, F.
Pflanzenzüchterische Studien an Winter- und Sommerwicken. **(Plant breeding studies of winter and spring vetches).**
Z. Pflanzenz. 1954 : **33** : 157–68.

Lines of *Vicia sativa* and *V. villosa* vars. *euvillosa* and *glabrescens* possessing increased resistance to shattering, an increased number of seeds per plant, a smaller proportion of inferior seeds and greater uniformity in flowering time were selected at Alferde, Hannover, from 1946 to 1952. No positive correlation was established between number of seeds produced per plant and number of haulms. A negative correlation was found between number of seeds per pod and 1000-grain weight. Natural cross pollination in *V. sativa* was considerably greater than anticipated and this factor, together with the constant occurrence of mutations, nullified attempts to obtain uniformity in testa colour.

1156 Ryka, C.
Studia cytologiczne nad *Vicia cracca* L. i *V. tenuifolia* Rth. **(Cytological studies of *V. cracca* L. and *V. tenuifolia* Rth.).**
Acta Soc. Bot. Polon. 1954 : **23** : 321–33.

The material for this study was obtained from seven localities in southern Poland. Both diploid and tetraploid forms of *V. cracca*, with $2n = 14$ and 28 respectively, were found, the diploid form, which is more fertile than the tetraploid, predominating. No specimens with 12 chromosomes were discovered. The discovery of mixoploids among diploid seedlings from one station lends support to the hypothesis that tetraploid biotypes originated by mutation from the diploid form. Studies of *V. tenuifolia* confirmed the previously established chromosome number of $2n = 24$, chromosome configurations suggesting that the species is an allotetraploid. The results of these investigations are compared with data obtained by other research workers and it is concluded that evidence to date supports the view that *V. tenuifolia* is a different species from *V. cracca*.

1157 Suetsugu, I. & Kobayashi, S.
(Studies on *Vicia villosa* Roth., in particular on fertilization and seed production).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : p. 150. [Japanese]; also in English, 150–51.

An investigation of the floral biology of the above species in Japan is reported. The flowers are self fertile but seed is not set unless insect or hand pollination occurs. Wet weather is highly detrimental to seed setting. The principal pollinating insects are *Bombus diversus* and *Anthophora florea*.

1158 Hollowell, E. A.
Registration of varieties and strains of *Lespedeza* spp. I.
Agron. J. 1954 : **46** : p. 524.

Rowan, a variety of *L. stipulacea* recently registered in the USA, is described (cf. *PBA*, Vol. XXII, Abst. 481).

1159 Hanson, C. H., Robinson, H. F. & Wells, J. C.
Inheritance of reaction to two forms of root-knot nematodes, *Meloidogyne incognita* and *M. incognita* var. *acrita*, in Korean lespedeza.
Agron. J. 1954 : **46** : 446–48.

Data on bulked F_1 families from the cross between the nematode-susceptible selection FC31850 and a moderately resistant variety Rowan indicated that a high proportion of the observed variation in reaction to either of the above nematodes was genetic and that selection among families would be effective. The possibility of additional progress from selection within families and from recombination of individuals superior with respect to resistance is briefly considered. A genetic correlation of + 0·93 was obtained between the reactions to the two forms of nematode; certain genes therefore determined resistance to both. Flower colour and nematode resistance were not linked.

1160 Wiggans, S. C.
The relationship of photoperiod to growth and flowering of *Melilotus* species.
Proc. Iowa Acad. Sci. 1953 : **60** : 278–84.

The response of the annual variety Hubam and the biennial varieties Madrid and Evergreen to different photoperiods was determined at the Iowa State College, Ames. Madrid and Evergreen grew most rapidly with long photoperiods of approximately 20 hours; Hubam was less affected by short photoperiods than were the biennial varieties, which needed a minimum of from 17 to 18 hours of light to produce flowers. Methods of manipulating the photoperiod to make *Melilotus* species available for breeding purposes at any desired time are outlined.

1161 Downey, R. K., Greenshields, J. E. R. & White, W. J.
The nature and inheritance of seed-coat spotting in permeable-seeded strains of sweet clover (*Melilotus alba* L.).
Canad. J. agric. Sci. 1954 : **34** : 514–27.

The permeability of the seed in certain lines of sweet clover depends upon the occurrence of brownish, sunken spots on the seed coat. Spotting has been found to be controlled by a major recessive gene and one or more modifiers in investigations at the Dominion Forage Crops Laboratory, Saskatoon, Sask. Spotting was also affected by the environment but the decisive factor could not be determined. On the basis of histological observations three possible causes of spotting are suggested.

1162 Hackbarth, J.
Neuere Gesichtspunkte bei der Züchtung der Lupine auf geringen Alkaloidgehalt. (**Recent considerations in the breeding of the lupin for low alkaloid content**).
Saatgutwirtschaft 1954 : **6** : 320–22.

Recent work on the breeding of sweet lupins in Germany is surveyed. It is suggested that, in the case of *Lupinus luteus*, attempts should be made to incorporate into new varieties additional genes for the inhibition of alkaloid production. In *L. angustifolius* and *L. albus*, where the genes for low alkaloid content may vary from one strain to another, intervarietal crosses may lead to the appearance of some bitter plants; caution should therefore be exercised in the registration of new varieties. The breeding programme would also benefit from further research into the level of alkaloid toxicity that can be tolerated by animals.

1163 Forbes, I. (Jun.) & Beck, E. W.
A rapid biological technique for screening blue lupine populations for low-alkaloid plants.
Agron. J. 1954 : **46** : 528–29.

At Tifton, Ga., populations of *Lupinus angustifolius* have been screened for low content of alkaloid by means of the preferential feeding of thrips (*Frankliniella tritici* and *F. bispinosa*) upon the foliage, young stems and green pods of the sweet plants. The method equals the chemical test in precision but can only be used where thrips occur naturally during the growing season. Loss of seed due to thrips injury could possibly be minimized by spraying with insecticide immediately after classification.

1164 Hollowell, E. A.
Registration of varieties and strains of trefoils (*Lotus* spp.). I.
Agron. J. 1954 : **46** : p. 526.

The variety Cascade (*Lotus corniculatus*) has recently been registered in the USA (cf. *PBA*, Vol. XXIII, Abst. 1279). Developed from selections of a European introduction, it is an erect, broad-leaved, persistent type with good seedling vigour, satisfactory recovery after grazing and high yielding capacity. It appears to be well adapted to soils with a high water table in western Washington and Oregon.

ROOTS AND TUBERS

1165 Hansen, H. P.
Et overblik over nyere erfaringer om virus-gulsot hos bederoer. (**A survey of recent findings on virus yellows of beet**).
Tidsskr. Planteavl 1954 : **58** : 298–332.

In the course of this review of recent literature, the immunity and resistance of *Beta* spp. are discussed. Highly tolerant forms of *B. vulgaris* var. *maritima* are found in southeast England. In Denmark the order of increasing susceptibility was: beetroot, mangel and sugar beet; in Germany the reverse order was found.

1166 Keller, E. R. & Frey, E.
Über die Schosserbildung bei Futter- und Zuckerrüben im Jahre 1954. (**On bolting in mangels and sugar beets in the year 1954**).
Mitt. schweiz. Landw. Zürich-Oerlikon 1954 : **2** : 207–11.

Of six varieties of sugar beet tested at Doggen and Worben, Switzerland, Kleinwanzleben E and N and Kleinwanzleben Polybeta proved least susceptible to bolting. Observations on mangel varieties carried out by the Federal Research Station, Zürich-Oerlikon, indicated that Red Øtofte and Yellow Øtofte were comparatively resistant to bolting.

1167 Cruickshank, I. A. M. & Palmer, T. P.
Resistance of swede varieties to dry-rot (*Phoma lingam* (Tode) Desm.).
NZ J. Sci. Tech. 1954 : **36** : 122–28.

Over 40 varieties were tested in the greenhouse and field for their reactions to *Ph. lingam*, the roots being artificially inoculated. Many of the varieties appeared to be mixtures of susceptible and resistant plants. Weibull's Balder, Weibull's Wilhelmsburger and a line of Wilhelmsburger Øtofte of unknown origin contained a high proportion of resistant individuals. New Zealand Wilhelmsburger is less likely to be severely damaged by the fungus than other commercial varieties cultivated in New Zealand.

1168 Das deutsche Kartoffelsortiment. (**The German potato collection**).
Kartoffelbau 1954 : **5** : p. 204.

Varieties authorized for cultivation in Western Germany are listed according to their maturity dates.

1169 Pflaumbaum, W.
Die Kartoffelzüchtung als Grundlage des deutschen Kartoffelbaues. (**Potato breeding as the basis of potato growing in Germany**).
Kartoffelbau 1954 : **5** : 197–98.

The importance of the potato breeding programme is stressed and increases in yield achieved during the past 75 years are attributed in part to the development of new varieties. It is concluded that further yield increases are attainable by breeding.

1170 Feistritzer, W.
Erhaltungszucht "Warum und Wie"? (**Pure stock maintenance, why and how ?**)
Kartoffelbau 1954 : **5** : p. 203.

The potato breeder's obligation to maintain the uniformity and quality of a variety by constantly eradicating deviating types arising from somatic mutations and to keep his breeding stock free from virus infection is emphasized.

1171 Höppner, E. & Geidel, H.
Ergebnisse der amtlichen Prüfungen mit Vorkeimkartoffeln im Jahre 1954. (**Results of official trials in 1954 of potatoes suitable for pregermination**).
Kartoffelbau 1954 : **5** : 273–74.

Tabulated data on the tuber yield, size and uniformity of the varieties Erstling, Sirtema, Vera, Comtessa, Saskia, Oberarnbacher Frühe [Oberarnbach Early], Frühmölle and Terena are presented. The information given is based upon trials conducted in 1954 and earlier years at ten centres in the German Federal Republic.

1172 Storoženko, Ju. G.
(**Local potato varieties in Sahalin**).
Zemledelie (Agriculture) 1954 : No. 9 : 106–10. [Russian].

Varieties notable for their good flavour are described. Sahalin 4 and Mestnyĭ Alyĭ [Local Red] are regarded as promising breeding material on account of their large, well-shaped tubers. Mestnyĭ Alyĭ is also distinguished by the compact arrangement of its tubers.

1173 De nya potatissorterna Jaakko och Peippo. (**The new potato varieties Jaakko and Peippo**).
Forskn.- o. FörsResult., Helsink. 1954 : **5** : 1–2.

These two Finnish potatoes have been described in Abst. 360.

1174 Krantz, F. A. et al.
The Osseo variety.
Amer. Potato J. 1954 : **31** : 273–77.

The potato variety Osseo (Cobbler x 56–1) is described in detail (cf. *PBA*, Vol. XXIV, Abst. 3107). It produces an unusually high percentage of round, smooth tubers of marketable size.

1175 Roemer, K.
Vom Zuchtstamm zur Sorte. (**From breeding line to variety**).
Kartoffelbau 1954 : **5** : p. 202.

Requirements to be fulfilled before a new potato variety is officially recognized in Western Germany are outlined and mention is made of the protection of breeder's rights.

1176 Zezjulja, R. D. & Ruhljadeva, M. A.
(**On to the collective farm fields with the potato variety Priekuljskiĭ Rannii**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : **34–35**. [Russian].

The variety Priekuljskiĭ Rannii [Priekuli Early] is a wart-resistant potato obtained from crossing Cobbler x Jubel. It ripens early and on 24 July at the Kiev experiment station it yielded 402 c. per ha. of tubers compared with 354 c. for Frühmölle and 292 c. for Early Rose; in the Moscow region it yielded 357 c. per ha. as against 300 c. from Epron. In all cases Priekuljskiĭ Rannii also had a higher proportion of high-quality tubers.

1177 Georlette, R.
Les espèces sauvages et semicultivées de Solanées tubérifères sud-américaines et leurs hybrides. Leur intérêt éventuel pour l'amélioration de la pomme de terre cultivée. (**Wild and semicultivated species of South American tuberiferous *Solanum* and their hybrids. Their possible interest in the improvement of the cultivated potato**).
Ann. Gembl. 1954 : **60** : 246–81.

A brief survey of recent work in Belgium and elsewhere on the utilization of South American species of *Solanum* in breeding for earliness, improved quality of the tuber and resistance to cold, drought, virus diseases, *Phytophthora*, scab, wart, eelworm and the Colorado beetle is followed by a comprehensive bibliography containing references to 334 works on the subject.

1178 Salaman, R.
The origin of the early European potato.
J. Linn. Soc. 1954 : **55** : 185–90.

The author reports the results of a study of potato collections from Chiloé between latitudes S. 41 and 43°, and from the neighbourhood of La Tempera, lat. S. 30°. As in previous investigations, the material was examined in terms of six leaf-index groups (cf. *PBA*, Vol. XVI, Abst. 1071 and Vol. XIX, Abst. 2650). The relative frequency of groups I–III, with predominantly *Solanum andigenum* characters, to groups IV–V, consisting of types resembling the European domestic potato, was 81 : 19 in the dried material from Chiloé. The three specimens from La Tempera were of the *S. andigenum* type. Evidence that leaf index has a genetic basis was obtained from observations on the variability of (1) a series of English varieties and seedlings, (2) a family derived from a Peruvian form of *S. andigenum* and (3) Chilean native varieties and their seedlings. The author therefore finds further support for his view that the European domestic potato did not originate in Chile, as postulated by Bukasov, but from *S. andigenum* of the northern region of S. America, prolonged selection for higher cropping varieties and suitable maturity after its introduction resulting in *S. tuberosum* types.

1179 Brücher, H.
Cytologische und ökologische Beobachtungen an nordargentinischen *Solanum*-Arten der Section *Tuberarium*. Teil I. Die Wildkartoffel-Arten des Aconquija-Gebirges. (**Cytological and ecological observations of north Argentine *Solanum* species of the section *Tuberarium*. Part I. The wild potato species of the Aconquija mountains**).
Züchter 1954 : **24** : 281–95.

Cytological and morphological data on the wild species *S. subtilius*, *S. simplicifolium*, *S. vernei*, *S. microdontum*, *S. catamarcae* and *S. acaule*, obtained from the Aconquija mountains of the Tucumán province, Argentina, are provided with a view to clarifying the ecological distribution of species of different chromosome number, the extent of natural interspecific hybridization and degree of natural selection. Contrary to expectation, it was found that higher altitudes did not lead to an increase in chromosome number, all the species examined having $2n = 24$. Extensive hybridization between *S. subtilius* and *S. simplicifolium* and between *S. microdontum* and *S. catamarcae*, combined with considerable hybrid vigour, was observed, the hybrids reproducing mainly vegetatively. It is suggested that *S. vernei* is one of the direct ancestors of cultivated *S. andigenum* forms,

and morphological and cytological support for this hypothesis is put forward.

1180 Bains, G. S.
Cytogenetical studies in the genus *Solanum* sect. *Tuberarium*.
Abstr. Diss. Univ. Camb. 1951–52 (1954) : 1–2.

Cytogenetical data have been obtained suggesting that the genus *Solanum* has a basic chromosome number of $x = 12$ and that, as pointed out by Stebbins, *S. tuberosum* may be a segmental allopolyploid. Since meiosis in 24-chromosome interspecific hybrids exhibited very regular pairing, structural differentiation was apparently absent among species with $2n = 24$. A high degree of preferential pairing in amphidiploids derived from interspecific hybrids characterized by a fair amount of intergenomic pairing suggested, however, some structural differentiation, possibly of a cryptic nature. It is concluded that the meiotic breakdown occurring in selfed progeny of *S. rybinii* is a genotypically controlled phenomenon and not a secondary effect of physiological unbalance resulting from inbreeding. The incompatibility system in the 24-chromosome species could not be determined but is believed to be more complicated than has been assumed by earlier workers. Grafting on various stocks proved to be useful in overcoming incompatibility of crosses involving *S. acaule*, *S. tuberosum* or *S. demissum*.

1181 Ermakov, A. I. & Lukovnikova, G. A.
(An approximate method for the quantitative analysis of "crude" protein in potato tubers).
Dokl. Akad. seljskohozjaïstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) **1954** : No. **6** : 39–42. [Russian].

The method described involves the use of NaOH to estimate the amount of nitrogen present in the protein compounds and is said to be suitable for the approximate evaluation of the protein content of breeding material.

1182 Koopmans, A.
Changes in sex in the flowers of the hybrid *Solanum rybinii* x *S. chacoense*. II. Plasmatic influences upon gene action.
Genetica 1954 : **27** : 273–85.

Data obtained by repeated back-crossing of F_2 plants of [(*S. rybinii* x *S. chacoense*) x *S. chacoense*] having abnormal flowers with *S. chacoense* and *S. rybinii* have provided further support for the view that the floral abnormalities are the result of incompatibility between the *S. chacoense* genes for floral structure and the plasmon of *S. rybinii* (cf. *PBA*, Vol. XXIII, Abst. 446).

1183 Haynes, F. L.
Potato embryo culture.
Amer. Potato J. 1954 : **31** : 282–88.

Embryos excised and transplanted to the culture medium 17 days after pollination were grown successfully. It is suggested that this method may be useful in obtaining progenies from difficult intraspecific and interspecific crosses in *Solanum*.

1184 Amaral, J. D.
Três anos de experiências de armazenamento de batata em Portugal. (**Three years' experiments on storing potatoes in Portugal**).
Bol. Jta. nac. Frutas, Lisboa 1952 : **12** : 57–115.

Varietal differences in the keeping quality of potatoes stored in ventilated warehouses are reported. The best keeping varieties were Arran Consul, Especial Rasteira and Valenciana.

1185 Kameraz, A. J. & Evgrafova, N. P.
(The question of breeding forage varieties of potato with high content of raw protein in the tubers).
Zemledelie (Agriculture) 1954 : No. **6** : 92–95. [Russian].

The standard variety Lorh contains 1·88–1·95% protein in the fresh tubers, whereas some of the species in the world collection contain up to 5%; these include *Solanum leptostigma*, *S. molinae*, *S. maglia*, *S. demissum*, *S. andigenum*, species belonging to the group Glabrescentia and some of the primitive species with short dormancy; many of these species are also characterized by high dry-matter content. Hybrids of many of them, even after several back crosses with *S. tuberosum*, have a protein content considerably higher than that of the common varieties; it was 3·85% in {[(*S. demissum* x Alma) x Alma] x Epron} x Grenzmark.

Some of the domestic varieties had protein contents of up to 3% or slightly over; thus Draga = 3·06%, Marija Hrennikova = 3·18% and Volžanin = 3·07%; the percentages varied somewhat in different years. Varietal differences were also observed in content of dry matter, vitamin C and solanin. In breeding varieties suitable for stock feed attention is being given also to the composition of the haulms, including low solanin content in the leaves.

1186 Börger, H., Köhler, D. & Sengbusch, R. v.
Untersuchungen über die Züchtung von Kartoffeln mit hohem Stärkeertrag. (**Investigations on breeding potatoes for high starch yield**).
Züchter 1954 : **24** : 273–76.

Crosses involving 22 domestic varieties were made at the Division for Crop Plant Breeding of the Max Planck Institute for Breeding Research, Hamburg-Volksdorf, to ascertain the mode of inheritance of high starch content and to discover parents useful in breeding for this character. The genetical basis of high starch content appeared to differ according to variety; in the case of Hochprozentige [High Percentage], high starch content proved dominant over low in crosses in which this variety was employed. The hybrid progeny of Hochprozentige, which is thought to be homozygous for high starch content, gave higher average yields of starch than all other hybrids. Some of the progeny of Fram x Flava also possessed an unexpectedly high starch content, which is attributed to a combination of recessive genes for this character. It was concluded on the basis of the experimental material employed that high tuber yield and high starch content are not mutually exclusive and that a combination of these two factors should present no difficulties.

1187 Stevenson, F. J., Akeley, R. V. & McLean, J. G.
Potato utilization in relation to variety (heredity) and environment.
Amer. Potato J. 1954 : **31** : 327–40.

Evidence that percentage dry matter is a heritable character is presented. In selfed lines varieties did not breed true, but the mean dry matter percentages of the seedlings were similar to but slightly lower than the parental values. Dominance of the character occurred in crosses involving Green Mountain. Data on varieties grown in different localities in the USA show that differences in dry matter content are often due to environment rather than heredity.

1188 Schreiner, W.
Rand- und Nachbarwirkungen bei Kartoffelversuchen. (**The effects of border and neighbouring plants on potato trials**).
Z. Pflanzenz. 1954 : **33** : 169–78.

Experiments conducted in 1951–53 at the Institute of Soil and Plant Cultivation, Bonn, showed that border rows gave yields up to 30% higher than the average of the plot as a whole. Border effects varied according to variety and type of soil, thus prejudicing the accuracy of trial results. The interspersion of rows of a different variety did not affect the yield of plants adjacent to these rows to a statistically significant extent. Factors of importance in the mechanical harvesting of trial plots are briefly discussed in the light of these findings.

1189 Viirsoo, E. V.
Observaciones en papas andinas. (**Observations on Andean potatoes**).
Rev. agron. Noroest. argent. 1954 : **1** : 87–98.

A special experimental station has been established at Humahuaca by the University of Tucumán in Argentina in order to study the local potatoes. The material so far studied includes forms of *Solanum andigenum, S. tuberosum, S. vernei, S. parodii* and two forms referred to as Luqui and Papa Odorata [Fragrant Potato] whose systematic position has not yet been determined.
Details are given concerning flowering, pollen production, fruit set, disease resistance and yield.
Crossing experiments have shown that most varieties of *S. andigenum* can be intercrossed; interspecific crosses have been made with Papa Odorata, Luqui and *S. vernei*, all of which are resistant to frost (cf. Abst. 1194); Papa Odorata has been crossed with species of the 24, 36 and 48 chromosome groups and *S. vernei* with *S. andigenum* and *S. tuberosum* in the 48 group.
The varieties Astilla, Bola, Collareja, Chacarera, Cuarentona, Papa Oca and Runa of *S. andigenum* were less attacked by leaf roll, mosaic and *Phytophthora infestans* than others. The highest yield of tubers was given by the *S. andigenum* varieties Tuni Chata, Collareja, Cuarentona, Chacarera and Runa.

1190 Mastenbroek, C.
De overerving van resistentie-eigenschappen bij de aardappel. (**The inheritance of factors for resistance in the potato**).
Erfelijkh. i. Prakt. 1954 : **15** : No. 3 : 2–6.

The economic importance of breeding for resistance is emphasized and the mechanism of inheritance of resistance to viruses X and A, potato sickness caused by *Heterodera rostochiensis*, wart, various physiological races of *Phytophthora infestans*, leaf roll, Colorado beetle and frost is outlined, together with data on the type of resistance involved, whether monogenically or polymerically determined, and segregation ratios encountered. Mention is also made of the use of wild species to introduce resistance into susceptible cultivated varieties.

1191 KAMEKE, D. v. & GEYER, H.
Wie entsteht eine neue Kartoffelsorte? (**How does a new potato variety originate ?**)
Kartoffelbau 1954 : **5** : 198–201.

This popular account of the technique of breeding for improved quality, disease resistance and earliness includes a brief mention of crosses that have been effected between cultivated varieties and wild species with a view to obtaining new disease-resistant strains.

1192 RUDORF, W. & ROSS, H.
Die Grundlagen der Resistenzzüchtung bei Kartoffeln. (**The basic principles of breeding for resistance in potatoes**).
Kartoffelbau 1954 : **5** : 208–09.

This brief popular account of breeding for resistance to diseases, drought and the Colorado beetle at the Erwin Baur Institute, Voldagsen, outlines successes achieved by use of *Solanum demissum*, *S. andigenum*, *S. acaule* and *S. stoloniferum*. It has been observed that the third and fourth back-cross generation of a resistant hybrid to its cultivated parent often results in plants with a higher yield than the original cultivated variety. It is suggested that genes for yield, suppressed in the wild form, become active and supplement genes for yield derived from the cultivated variety.

1193 FILIPPOV, A. S.
(**Effect of low temperatures upon the winter hardiness of seedling potatoes**).
Agrobiologija (Agrobiology) 1954 : No. 5 : 43–49. [Russian].

Crosses and back crosses of domestic varieties with *Solanum schreiteri*, *S. punae* and *S. demissum* have been selected at Malahovka, Moscow province. They are immune to *Phytophthora* and resistant to 4° C. of frost; some outyield Lorh. The hardiness of this material was improved when hybrid seed and the tubers of the first to fifth generations were vernalized at 0–1° C. and sown in late summer upon peat soils.

1194 VIIRSOO, E. V.
Informe sobre la resistencia a las heladas de algunas especies argentinas del género *Solanum*. (**Report on the frost resistance of some Argentine species of the genus *Solanum***).
Rev. agron. Noroest. argent. 1954 : **1** : 83–86.

A frost of —5° C. at Humahuaca in Argentina destroyed all specimens in a collection of Argentine *Solanum* species with the exception of eight, which included forms of *S. vernei* and *S. millanii* and *S.* sp. 'Luqui' and 'Papa Odorata' [Fragrant Potato]. *S. andigenum* 'Collareja' also displayed a certain degree of resistance.

1195 ERWIN, A. T., PETERSON, C. E., SCHAAL, L. A. & EDMUNDSON, W. C.
Osage: a new baking-type potato variety resistant to common scab.
Amer. Potato J. 1954 : **31** : 299–304.

The variety Osage (USDA Seedling X245–186 x Katahdin) is described. It is found to be more resistant to *Streptomyces scabies* in the north-central states of the USA than are the varieties Irish Cobbler, Triumph and Cherokee. Storage and cooking qualities are good but its yield is generally lower than that of Cherokee or Irish Cobbler. The most serious defect observed is a tendency to develop hollow heart.

1196 HOFFMANN, G. M. & SCHRÖDTER, H.
Mikroklimatische Untersuchungen bei Kartoffelschorf-Infektionen in Lochtöpfen unter Freilandbedingungen. (**Microclimatic investigations of scab infections of potted potatoes grown in the open**).
Züchter 1954 : **24** : 131–37.

Experiments carried out by the Central Biological Institute of the German Academy of Agricultural Sciences, Berlin, in conjunction with other East German research organizations, indicated that results obtained from outdoor tests were more reliable in assessing the scab resistance of mature plants than were tests under greenhouse conditions. No significant differences in external moisture or temperature conditions were ascertained in comparisons between plants grown outdoors in infection pots (cf. *PBA*, Vol. XXII, Abst. 2821) and plants growing in the field.

1197 SCHICK, R., SCHICK, E. & HANK, H.
Einige Bemerkungen zu einer internationalen Nomenklatur der *Phytophthora*-Rassen und der die *Phytophthora*-Widerstandsfähigkeit kontrollierenden Gene der Kartoffel. (**Some remarks on an international nomenclature of races of *Phytophthora* and on the genes governing resistance to *Phytophthora* in the potato**).
Züchter 1954 : **24** : 249–52.

Experiments with ten races of *Ph. infestans* at the Plant Breeding Institute, Gross-Lüsewitz, Germany, have led to the postulation of two

further resistance genes, designated R_0 and R_5, in addition to the four genes specified by Black. A new race of *Ph. infestans*, designated 00, was isolated from Sieglinde; it differs from race 0 in being less virulent and in attacking a smaller range of varieties. The gene R_5 is presumed to be present in certain types of *Solanum demissum* that have proved resistant to all known strains of the fungus.

1198 LeBeau, F. J. & Schieber, E.
Late blight of potatoes in Guatemala.
Plant Dis. Reptr. 1954 : **38** : 613–15. (Mimeographed).

Varieties carrying the gene R_1 for late-blight resistance have remained free from the disease, indicating that race 1 of the fungus was not present in the localities under investigation. With one exception, the native varieties showed considerable resistance but were generally late-maturing, stemmy and without tuber uniformity. Using resistant varieties, yields five to six times the national average were obtained from plantings in the rainy season.

1199 Chambers, S. C.
Testing potato haulms for resistance to Irish blight.
J. Dep. Agric. Vict. 1954 : **52** : 456–59.

Plants of 22 varieties and hybrids were inoculated with the local strain of *Phytophthora infestans* in Victoria, the test chamber being maintained at 100% relative humidity at 60–70° F. The varieties and hybrids fell into two sharply defined classes, susceptible and resistant. In breeding, the following hybrids should prove useful as sources of haulm resistance to the local strain of late blight: Kennebec, S2674, Black 914A(12), 75–1, 76–15 and 77–3.

1200 Ivančenko, G. Z.
(New early potato varieties resistant to wart and *Phytophthora*).
Agrobiologija (Agrobiology) 1954 : No. 5 : 50–55. [Russian].

Hybrid 1975s/46 from Glückspilz x Mihnevskiĭ and hybrid 437s/46 from 5419s/44 x Hindenburg have proved resistant to wart and *Ph. infestans*. Both are distinguished by high yield, earliness and good tuber quality. Other material bred for resistance to *Ph. infestans* comprises crosses between resistant and susceptible varieties, selfings of resistant forms, and crosses between domestic varieties and *Solanum demissum*. The interspecific crosses were facilitated by vegetative rapprochement involving such stocks as tomato, nightshade and the domestic potato variety Oktjabrenok [Little Octobrist].

1201 Estrada Ramos, N.
Mejoramiento genético de la papa en Colombia, para resistencia a la "gota" causada por el *Phytophthora infestans* (Mont.) de Bary. [**Genetic improvement of the potato in Colombia, for resistance to blight caused by *Ph. infestans* (Mont.) de Bary**].
Rev. Fac. nac. Agron., Colombia 1954 : **15** : No. 45 : Pp. 130.

This thesis, in addition to giving general data on potato cultivation in Colombia and the losses caused by *Ph. infestans*, presents a review of the literature on breeding for blight resistance by the use of wild species, on the inheritance, nature and mechanism of resistance, and on biological specialization in the pathogen. In his own experiments the author has used the wild species *Solanum demissum*, *S. malinchense*, *S. andreanum* and *S. colombianum* and the cultivated species *S. tuberosum* subspp. *andigenum* and *chileanum*, *S. rybinii* and *S. stenotomum*, in addition to some lines obtained from Black, Reddick and others; a full list is given of the forms used and the crosses made. The seedlings were tested in the laboratory for reaction to the common strain of the fungus and their behaviour in the field was also noted. Seedlings of the variety Soliman of *S. rybinii* did not seem to have inherited the resistance reported in the parent. Similarly the seedlings of *S. demissum* 66, which itself was immune, showed only medium resistance. *S. demissum* gave progenies only when used as seed parent, and no seed at all was obtained from *S. malinchense* or *S. colombianum*, when pollinated with either *S. tuberosum* subsp. *andigenum* or *S. rybinii*; fruits were obtained from *S. andreanum* x *S. rybinii* but they contained no seed. Large amounts of seed were produced from crosses of *S. demissum* 641 x *S. stenotomum*, which proved to be a more fertile combination than *S. demissum* x *S. rybinii*.

The most promising sources of resistant material seemed to be crosses involving *S. demissum* and local cultivated varieties such as Tuquerreña, Tocana, Argentina, Pana blanca and Quincha. The F_1 hybrids were vigorous, fertile and resistant; they, as well as resistant hybrids introduced from elsewhere, are being back-crossed with the local varieties, which are superior in quality as well as in climatic adaptation and resistance to virus and other diseases. The results of field and laboratory tests of blight reaction did not entirely coincide and there are indications that several biotypes of the fungus exist and that some of these are

different from those found in Europe and the USA.

1202 KELLER, E. R.
Bemerkungen zum Auftreten der Kraut- und Knollenfäule bei Kartoffeln. (**Remarks on the occurrence of late blight in potatoes**).
Mitt. schweiz. Landw. Zürich-Oerlikon 1954 : **2** : 181–84.

This popular account of work being conducted at the Federal Agricultural Experiment Station, Zürich-Oerlikon, and elsewhere in breeding for resistance to *Phytophthora infestans* includes a short note on the genetic basis and mode of inheritance of resistance and brief information on the occurrence of new physiological races of the fungus in Switzerland.

1203 SCHECHAJ, R.
Avaluación de las variedades de papa según su resistencia a *Phytophthora infestans* (Mont.) de Bary, en plantaciones de primavera y verano en la Estación Experimental "El Suncho," Catamarca. [**Evaluation of potato varieties according to their resistance to *Ph. infestans* (Mont.) de Bary, in spring and summer plantings at the El Suncho Experimental Station, Catamarca**].
Rev. agron. Noroest. argent. 1954 : **1** : 135–55.

The varieties normally grown in Argentina are all susceptible to blight and gave better yields of tubers when planted in spring than in summer. Some varieties introduced from Europe proved resistant and these gave better yields from summer planting, whereby they escaped the effects of virus and benefited from the warm, humid conditions during the growing season. The same applied to the local variety Blanca or Imilla, which proved resistant to the local races of blight and also possessed a certain degree of resistance to virus diseases.

1204 KEKUH, A. M.
(**Improving the disease resistance of plants by vegetative hybridization**).
Agrobiologija (Agrobiology) 1954 : No. 5 : 37–42. [Russian].

Grafting wart-resistant varieties such as Ella on to susceptible varieties resulted in the transference of resistance to the stock in experiments at the USSR Potato Research Station. Selection over four tuber generations has resulted in material combining the high yield, earliness, compact arrangement of the tubers in the soil, high starch content and good flavour of the susceptible stock with the disease resistance of the scion.

1205 GEDZJ, S. M.
(**Vegetative hybridization of potatoes using stolon grafting**).
Zemledelie (Agriculture) 1954 : No. 11 : 80–81. [Russian].

At Černovicy, wart resistance was transmitted to the tuber generations of susceptible varieties grafted on to the stolons of resistant forms. Tubers formed on the stolons of the variety used as the mentor were left intact but those of the other component removed. Up to 30% of the grafts were successful, but the percentage was still higher when the calluses were treated with a 0·0005% solution of heteroauxin for 5–6 days. Mention is made of changes in tuber colour observed in an F_0 hybrid between one variety with red and another with white tubers; it produced two pink and two white tubers and one of the white tubers had mauve eyes.

1206 En Balcarce realizóse una reunión coordinadora de trabajos en papas. (**A meeting on coordination of work on potatoes was held at Balcarce**).
Idia 1954 : No. 78 : 11–15.

Among the various topics discussed was the resistance of potato varieties to *Fusarium solani* var. *fumartii*, Katahdin, Kennebec, PO7, B25–50B and B25–50E being indicated as outstanding.

1207 RICHTER, H. & SCHNEIDER, R.
Untersuchungen zur *Rhizoctonia*-Anfälligkeit der Kartoffelsorten II. (**Investigations on the susceptibility of potato varieties to *Rhizoctonia*. II.**).
Züchter 1954 : **24** : 264–71.

Field trials conducted at a number of centres in Eastern Germany during 1950–53 confirmed the results of previous experiments (cf. *PBA*, Vol. XXI, Abst. 2799); none of the 37 domestic varieties tested proved in the least resistant, nor could any reliable information on varietal differences in susceptibility be obtained. The results of laboratory experiments tallied closely with those of the field trials; in addition, 56 wild species of *Solanum* were tested for resistance to the fungus. All proved susceptible.

1208 TORKA, M.
Die Käferresistenz der Ser. *Commersoniana* von *Solanum* Sect. *Tuberarium*. (**Resistance to the Colorado beetle in Ser. *Commersoniana* of *Solanum* sect. *Tuberarium***).
Züchter 1954 : **24** : 138–39.

Of sixteen species of the *Commersoniana* series

tested at the Rosenhof substation of the Max Planck Institute for Breeding Research, Voldagsen, thirteen, including *S. chacoense*, contained some plants possessing resistance to the Colorado beetle. Resistance was polygenically determined and easily transferred to *S. tuberosum*. Data on the origin of the 28 species of *Commersoniana* described by Hawkes (cf. *PBA*, Vol. XIV, p. 269) are given, together with the degree of resistance displayed by those species tested at Rosenhof. It is pointed out that, although breeding for resistance to the Colorado beetle has been confined to using *S. chacoense* as the resistant parent, considerable valuable material exists in other members of the *Commersoniana* group.

1209 Kuhn, R. & Löw, I.
Gluco-alcaloides de especies silvestres de *Solanum* y de *Lycopersicum* y su significación para la resistencia al escarabajo de la patata. (**Glucoalkaloids of wild species of *Solanum* and *Lycopersicum* and their significance for resistance to Colorado beetle**).
Ciencia, Méx. 1954 : **14** : 7–14.

Reference is made to races of *Leptinotarsa decemlineata* resistant to DDT which have been found in Spain. In investigations at the Max Planck Institut für Züchtungsforschung [Max Planck Institute for Breeding Research] in Germany on the alkaloids contained in the leaves of various species of *Solanum* and *Lycopersicon*, three separate solanins and three chaconins have been isolated from *Solanum* species; *S. chacoense*, which is resistant to Colorado beetle, has a particularly high total content of alkaloids in its leaves and an exceptionally high proportion of chaconins. The total amount of them is however not sufficient to explain its resistance. *S. demissum*, which is resistant to the larvae but not to the mature insects, contains a fourth solanin, demissin, which is more powerful in its inimical effect on the pest and is present in sufficient quantity to cause the resistance of this species.
The reaction of M yeast to these respective alkaloids was exactly parallel to that of the beetle larvae.

1210 Bercks, R.
Weitere Infektionsversuche mit verschiedenen X-Virusherkünften an Kartoffeln. (**Further experiments on the infection of potatoes with different virus X strains**).
Züchter 1954 : **24** : 271–73.

Further data (cf. *PBA*, Vol. XXIV, Abst. 1236) on the reaction of potato varieties to different strains of virus X are provided. In the latest series of experiments the degrees of virulence of cultures from Flava, Frühgold [Early Gold], Marktredwitzer Frühe [Marktredwitz Early], Merkur, Niederarnbacher Jacobi, Obernarnbacher Frühe [Oberarnbach Early], Panther and Roswitha were tested on Ackersegen, Capella, Frühbote [Early Messenger], Heida, Oberarnbacher Frühe, Sabina and Sieglinde. The distribution and concentration of the virus in the different varieties infected indicated that degree of infection was not dependent upon virus strain or potato variety alone but upon an interaction between these two. Virus cultures from Frühgold proved the least virulent. Sieglinde displayed the least degree of susceptibility to infection.

1211 Cordner, H. B., Struble, F. B. & Morrison, L.
Breeding sweetpotatoes for resistance to the root-knot nematode.
Plant Dis. Reptr. 1954 : Suppl. No. 227 : 92–93. (Mimeographed).

In breeding for resistance to *Meloidogyne incognita* at the Oklahoma Agricultural Experiment Station, crosses of the type resistant x resistant, susceptible x susceptible and resistant x susceptible have given progenies containing 50%, 10% and approximately 33% resistant plants, respectively. The resistant parents used were Orlis, Nemagold (Okla. 46), E7 and eight Oklahoma breeding lines. Jersey types were among those found to be resistant in tests of the reaction of named varieties.

1212 González Díaz, E.
Estudio comparativo de variedades de boniato. (**Comparative study of sweet-potato varieties**).
Rev. Agric., Habana 1954 : **37** : No. 2 : 86–91.

A description is given of the 25 best varieties from a collection of 130 varieties tested in Cuba. The data include yield, resistance to *Cylas formicarius elegantulus* and quality and composition of the tubers.

1213 Gunewardena, K. J.
A note on the characters and performance of some sweet potato varieties.
Trop. Agriculturist 1954 : **110** : 36–38.

Notes are given on the characters and performance of ten varieties studied at the Peradeniya Experiment Station, Ceylon.

1214 Howell, M. J. & Wittwer, S. H. **Chemical induction of flowering in the sweetpotato.** Science 1954 : **120** : p. 717.
Flowering was induced in the varieties Porto Rico and Gold Rush by foliar application of 2,4-D. It is pointed out that an effective method of inducing flowering and seed production would facilitate sweet-potato breeding.

FIBRES

Symposium on "Perennial Cottons". Fifth Conference on Cotton Growing Problems in India, of the Indian Central Cotton Committee, 1952 : Pp. 71.
The following papers were read at the Fifth Conference on Cotton Growing Problems in India, held in Bombay on 6 March 1952.

1215 *Daddabhai Naik.* (*The production of perennial cottons*). [*Hindi*]. (*pp. 1–11*).
The value of perennial cottons to the Indian economy is discussed and trials to determine whether they are adapted to areas unsuitable for the cultivation of annual varieties are urged.

1216 *Balasubramanian, R. Perennial cottons.* (*pp. 11–20*).
The history of the cultivation of perennial cottons in India is briefly surveyed and information on the economic characters of perennial forms of Indian, Chinese and South American provenance studied at the Coimbatore Cotton Breeding Station is given.

1217 *Singh, M. P. A note on the perennial cottons in Bihar.* (*pp. 21–23*).
A brief description of species and varieties native to the Bihar province is given, together with an account of breeding work in the state and the introduction of new types from southern India.

1218 *Venkoba Rao, S. B. & Iyengar, G. S. A short note on the trials conducted on perennial cottons in Mysore State.* (*pp. 23–25*).
The results of trials of the Brazilian varieties Mocó, Quebradinho, Verdão and Herbação, introduced into Mysore State in 1938–39, are presented. Mocó is well adapted to the climatic conditions of the region and gives higher yields and possesses a longer staple length than the other three varieties.

1219 *Dabral, B. M. A note on perennial cottons in Uttar Pradesh.* (*pp. 25–29*).
Species cultivated in Uttar Pradesh are described briefly and data on breeding at present in progress given.

1220 *Bhat, N. R. & Kelkar, S. G. Prospects for the large scale cultivation of perennial cottons in the Bombay State.* (*pp. 30–44*).
Mocó gave the highest yields in trials in the heavy rainfall areas of western Bombay. The F_1 generations of crosses between the perennial varieties Mocó and YS on the one hand and the annual *G. hirsutum* variety Co4 on the other grew vigorously and gave good yields of long-stapled cotton.

1221 *Bederker, V. K. Growing perennial cotton in Hyderabad State.* (*pp. 45–63*).
Data on time to maturity, plant height, number of bolls per plant, boll size, total yield of raw cotton, fibre properties, ginning percentage and susceptibility to insect pests are provided for 34 varieties of American and Asiatic origin at present undergoing trials at the Cotton Research Station, Nanded and at the Raichur Experiment Farm.

Progress reports from experiment stations, season 1952-53. Emp. Cott. Gr. Corp. Lond. 1954.

1222 *Hutchinson, J. B. Survey of progress reports for the season 1952–53.* (*pp. 1–13*).
Genetical and breeding investigations are among the activities briefly surveyed.

Cotton Research Station, Namulonge, Uganda. Progress report for the season 1952–53.

1223 *Wickens, G. M. Plant pathology.* (*pp. 27–29*).
Investigations on methods of seed, stem and boll inoculation with *Xanthomonas malvacearum* continued.

1224 *Hutchinson, J. B., MacDonald, D. & Manning, H. L. Plant breeding.* (*pp. 29–34*).
Selections of lines of Albar 51 and BP52 showing promise with respect to resistance to the stem phase of bacterial blight and other characters have been obtained. Plants of Albar 51 displaying a useful degree of resistance to *Verticillium* wilt are to be tested for blight resistance when stem-inoculated; resistant selections will be further screened for their reaction to *Verticillium*. The results from replicated progeny rows, a small bulk trial and district variety tests indicate that progress has been made in the development of higher yielding selections of BP52.

1225 *Peat, J. E., Munro, J. M. & Arnold, M. H. Tanganyika Territory. Lake Province. Progress report for the season 1952–53.* (*pp. 1–21*).

Breeding for bacterial-blight resistance, using Albar 51 as the source of resistance, continued. Unbalanced types have been frequent among Albar 51 segregates and the hybrid progenies; such individuals wilt at any stage up to the time when the bolls are opening and, if left, eventually die. Selection for blight resistance is based on (1) seed inoculation, and (2) stem inoculation, using Wicken's needle-prick technique. The Uk series of composite seed-issues has outyielded Mz561 in trials during the period 1949–1953, Uk51 giving the highest yields (cf. *PBA*, Vol. XXIII, Abst. 2817). An addition to this series, Uk53, made up of 11 strains, underwent its first multiplication in the 1953–54 season.

1226 *Hastie, M. S. Kenya. Nyanza Province. Progress report for the season 1952–53.* (*pp. 1–7*).

Trials carried out in four localities indicated that with fairly early planting Uk48 compares favourably with other varieties and strains.

Anglo-Egyptian Sudan. Progress report of the cotton breeding stations, season 1952–53.

1227 *Rose, M. F., Hughes, L. C. & Low, A. Gezira Station.* (*pp. 2–10*).

The Egyptian cottons BAR4/16 [X1730A(B_2B_3)], BAR4/16–664 (a quality type) and BAR5/6 [X1730A($B_2B_3R_2^{RS}$)] were further selected. With a view to obtaining cottons suitable for mechanical picking, the American Uplands BAR NT 96 Cluster and Stormaster were rogued for off-types. The American-Upland irrigated variety Wilds SUS16/1 is being acclimatized; it is even earlier than Domains Sakel, and although susceptible to blackarm when inoculated by spraying, has escaped infection in central Gezira; it is resistant to *Rhizoctonia* wilt and produces lint of good grade. Work continued on the production of a salt-tolerant form of BLR14/25 (Sakel type with N_2, B_3 and some resistance to leaf curl) and on the transference of lint retention from *G. contextum* to BLR14/25. The behaviour of X1730 strains confirmed Knight's hypothesis that the commercial Gezira crop contains two distinct genotypes, one resistant to shade conditions.

The percentage of natural crossing was found to be unexpectedly low (0·19–1·36%).

1228 *Knight, R. L., Dark, S. O. S. & Cuany, R. L. Shambat Station.* (*pp. 10–16*).

In work on derivatives of Domains Sakel, filtering of the leaf-curl resistant BLR14/25 for a higher grade of resistance to this disease is giving positive results. Transferences of B_{6m} (cf. *PBA*, Vol. XXIII, Abst. 1324) to BAR4/16, BAR5/6 and BLR14/25 and to Sakel and X1730 types homozygous for B_2 only are upon the point of completion. Sakel and X1730 types homozygous for B_5 have been developed. Progress is also reported in the transference, to Sakel, of B_7 from Stoneville 20 and of the genes for blackarm resistance in *G. herbaceum* 'Wagad 8.' The homology of transferred Asiatic genes is being checked.

In American-Upland breeding, transference of B_{6m} from synthesized Sakel strains to B_2 or B_2B_3 types is under way. The transference of B_2 and B_{6m} to Wilds SUS16/1 has also been undertaken.

The basic gene for hairiness in the Upland type Philippines Ferguson has been designated H_1^k (cf. *PBA*, Vol. XXIV, Abst. 2236). Since H_1^k is completely linked with chl_1 for chlorophyll deficiency, the minor-gene complex for hairiness in Ferguson has been combined with H_1 of Tangüis origin by repeated back-crossing to blackarm-resistant Sakel H_1; further back-crossing is required to improve lint quality. The basic gene for hairiness in Wagad 8 is identical with H_1 (cf. *PBA*, Vol. XXIV, Abst. 2237). Work on the genes for hairiness from *G. arboreum*, *G. mustelinum*, St. Ignatius (var. *marie-galante*) and Hairy Giza 36 continued. Jassid resistance is being imparted to Wilds SUS16/1. Spinning tests of the Sakel type BLJR14/23 (H_1 + B_2 + leaf-curl resistance) showed that this genotype has no adverse effect upon quality.

Transference of increased number of locules from 4*n G. herbaceum*, Ferguson, Punjab 268F and 244F, Stoneville 20, Pubescent T611 and Clevewilt to Sakel continued. Increased number of ovules per locule is being introduced into blackarm-resistant Sakel from *G. auritum*.

Pentaploids from *G. "anomadense"* x BLR14/25 have been back-crossed with BLR14/25.1 as ♂. The objectives of this work are (1) to transfer the character of narrow bracts from *G. anomalum* to Sakel, (2) to discover whether lint-quality genes can be transferred from *G. anomalum* and (3) to isolate any major genes for hairiness carried by *G. anomalum*. New World cottons were crossed with *G. robinsonii*, *G. sturtii*, *G. somalense*, *G. gossypioides*, *G. klotzschianum*, *G. klotzschianum* var. *davidsonii* and *G. raimondii*; the hybrid seed will be colchicine-treated. American hexaploid accessions were crossed with BLR14/25.2.

Progenies involving *G. "armadense"* and *G. "thurbadense"* in their parentage were selected for bollworm resistance; promising selections were selfed, or back-crossed to BLR14/25.2 or BAR11/7 [XA129 (selection of Pump Scheme Strain) B_2B_3].

In polyploid induction, treating the seeds with colchicine proved to be more efficient than various methods of treating the buds of seedlings. Treated with an "abscission-suppressing hormone," a sterile 3*n* form retained its bolls for two months until they reached maturity; this technique may be valuable in making difficult crosses, enabling weak embryos to become established.

1229 *Rose, M. F. & Hassan Effendi Omer El Bahari. Kadugli Station.* (*pp. 17–20*).

The second filter of the Upland cotton BAR7/8 [BAR SP84 (B_2B_3)] was produced for variety testing. In the 1952–53 trials, BAR7/8 significantly outyielded BAR SP84 (B_2) and Pump Scheme Strain (b_2), as the result of its high degree of resistance to blackarm and its robustness.

1230 *Ducker, H. C. & Smith, R. Nyasaland. Cotton Experiment Station. Progress report for the season 1952–53.* (*pp. 1–9*).

Cotton. Production and multiplication of filter bulks of CL20 continued. Albar 49 x CL20 and Albar 49 x BP52 x CL20 were grown in their third year of "panmixis" and were rogued for susceptibility to bacterial blight and jassid.

Other crops. A recently discovered groundnut sport having an ivory-white testa may be of interest to manufacturers of protein synthetic fibres. Variety trials were carried out on groundnut, maize and sorghum. Hybrid maize again did well.

1231 *Gillham, F. E. M. Southern Rhodesia. Cotton Research Station, Gatooma. Progress report for the season 1952–53.* (*pp. 1–3*).

The crosses A5851 x Albar 49 and A618 x Albar 49 were back-crossed with A5851 and A618, respectively. Albar 51 was crossed with A5851 and A618. Breeding material was selected for resistance to bacterial blight and jassid.

1232 *King, H. E. Northern Nigeria. Progress report for the season 1952–53. Plant breeding.* (*pp. 3–9*).

Samaru 26C and various Allen stocks were further selected. Resistance to leaf tattering, ascribed to *Campylomma* and other mirids, is heritable. Strains derived from 26C and having better lint quality than the original variety were tested in eight districts. Strains 479–5 and 49160–23 gave promising yields but require to be reselected to improve their ginning percentage.

1233 *Anson, R. R. Aden Protectorate. Abyan Cotton Experiment Station. Progress report for the season 1952–53.* (*pp. 1–8*).

The development of nucleus seed stocks of the local commercial cotton is receiving priority. Of the varieties so far tested, X1730 types appear the most suitable.

1234 *Lochrie, J. V. & Spence, J. R. West Indies. Cotton Experiment Stations. Progress report for the season 1952–53.* (*pp. 1–15*).

Selection of V135 and MS1 continued at the St. Vincent and Montserrat stations, respectively. In Antigua, VH8 and BD were further selected, to develop strains suitable for replacing MS1 in this island and Nevis. Higher yielding strains of BD have been isolated, intermediate between MS1 and VH8 in spinning quality, but market requirements at present favour VH8. A wide range of cottons is under observation in British Honduras and British Guiana, to explore the possibility of growing the crop in these colonies.

1235 *Peters, R. W. Queensland. Regional Experiment Station, Biloela. Progress report for the season 1952–53.* (*pp. 1–10*).

Selection of jassid-resistant back-cross strains of Miller continued.

1236 Kanaš, S.
(Ways of improving cotton breeding and seed production).
Hlopkovodstvo (Cott. Raising) 1954 : No. 11 : 42–49. [Russian].

Reference is made to a number of new varieties which ripen 10–18 days earlier than 108–F, excel it also in yield, lint quality and resistance to wilt and are more suitable for mechanical harvesting; some of them have determinate branching and can be planted more densely; one of them sheds 90–95% of its leaves when the bolls ripen. Others include high-yielding *Fusarium*-resistant forms with fine lint of better quality than any in the world collection; large-bolled early varieties resistant to wilt and gummosis; varieties with coloured lint and others with woolly lint. The early varieties S–9010 and S–9017 are referred to as having bolls weighing up to 10 g. and over and lint exceeding 29–30 km.* in length and others have a ginning percentage of 42–43–44%.

* *sic.* ; presumably a typographical error for mm.

The methods applied in breeding these varieties have comprised intraspecific hybridization and selection under growing conditions appropriate to allow of the expression of the characters desired. Further improvements are expected from the many interspecific hybrids that have been made during the last 25 years. An early-maturing variety resistant to gummosis has been produced by crossing *Gossypium hirsutum* x *G. herbaceum*, and this variety, No. 8802, has served as a parent for introducing resistance to gummosis and wilt into all later crosses. A fine-linted cotton, 114–1, possessing resistance to *Fusarium* and gummosis, selected from the cross *G. barbadense* x *G. arboreum*, is also being used widely as a parent. By employing American x Egyptian hybrids for pollinating fine-linted cottons a valuable hybrid, S–6005, combining high quality, earliness and resistance to *Fusarium* has been selected; other hybrids have bolls weighing up to 6 g.

A number of other promising varieties have been produced by vegetative rapprochement and graft hybridization; the degree to which the maternal and paternal characters are transmitted has been influenced by grafting on suitable rootstocks and by the respective ages of the maternal flowers and of the pollen.

1237 Carvalho, M. de.
Resultados dos ensaios comparativos de variedades (1949/50 a 1951/52). [**Results of comparative tests of varieties (1949-50 to 1951-52)**].
Bol. Soc. Estud. Moçambique 1954 : Supl. No. 85 : Pp. 82; Mem. Trab. Cent. Invest. cient. algod. 1954 : No. 14 : Pp. 82.

The statistical analysis of further results of observations on cotton varieties (cf. *PBA*, Vol. XXII, Abst. 1281) at three experimental stations in Moçambique is presented. The order of merit of some of the varieties varied in different years but consistent differences were established in favour of the variety A2106 for the Namapa region, of BP50 and A2106 for the Chemba region and BP50 for Maniquenique. BP50 is resistant to jassid and has lint of good quality but its lint percentage still leaves much to be desired.

1238 Svetašov, A.
(**The question of a new system for producing cotton seed**).
Hlopkovodstvo (Cott. Raising) 1954 : No. 10 : 42–44. [Russian].

Data are presented showing that continuous individual plant selection in the varieties D–41 and S–15–200 led to a reduction of yield whereas intravarietal crossing in the same varieties led to an increase of 6·2%.

1239 Junusov, A. & Šafrin, A.
(**The work of producing élite seed of cotton at the Stalin Collective Farm**).
Hlopkovodstvo (Cott. Raising) 1954 : No. 11 : 54–59. [Russian].

The work on seed production of the variety 108F on this Ukrainian collective farm includes intravarietal crossing, material of the same variety obtained from elsewhere being used to pollinate mother plants selected at the farm. In this way the ginning percentage has been raised from 36·3 to 37·6 and the boll weight from 6·3 to 8·0 g.

1240 Harris, H. B. & Loden, H. D.
The relative growth rates of an F_1 hybrid of *Gossypium hirsutum* L. and its two parents.
Agron. J. 1954 : **46** : 492–95.

In experiments carried out at the Southeastern Soil Conservation Station, Watkinsvill, Ga., the F_1 hybrid between Deltapine 15 and a red-leaved noncommercial stock (Synthetic Line 7–9) exhibited hybrid vigour with respect to the mean of the parents for stem length, number of squares, number of fruits, leaf-blade weight, total dry weight of the above-ground plant parts, dry weight of stems, leaves or fruits, and possibly stem length. The first significant expression of general hybrid vigor was evident 49 days after planting.

1241 Gerstel, D. U.
A new lethal combination in interspecific cotton hybrids.
Genetics 1954 : **39** : 628–39.

Data on the crosses *Gossypium arboreum* race *bengalense* 'Sanguineum' 4*n* x *G. hirsutum*, (Sanguineum x *G. herbaceum*) 4*n* x *G. hirsutum* and (Sanguineum x *G. anomalum*) 4*n* x *G. hirsutum* indicated that Sanguineum and *G. hirsutum* each carried a gene for lethality, Rl_a and Rl_b, respectively. The latter factor was detected in all the lines of Upland tested but not in the primitive strain Lacandon of *G. hirsutum* race *latifolium* nor in *G. barbadense*. The author makes suggestions as to crosses which could be undertaken to determine whether Rl_a and Rl_b are alleles or complementary genes. A parallel is drawn between heterosis and lethality due to complementary genes, both phenomena being based upon changes in the physiological equilibrium. Specific genes for lethality may have made certain interspecific crosses hitherto impossible; strains with nonlethal genes may yet be discovered.

1242 Simpson, D. M.
Natural cross-pollination in cotton.
Tech. Bull. US Dept. Agric. 1954 : No. 1094 : Pp. 17.

The author summarizes the results of a regional test carried out in the cotton belt of the United States for four seasons to determine the extent of natural crossing. Data from 48 separate tests in 12 States indicated that the amount of natural hybridization ranged from less than 10% in parts of central Texas to approximately 50% in localities in the south-eastern region of the cotton belt. The degree of natural crossing is closely related to the frequency and timeliness of the visits of insect pollinators, crossing being less frequent in areas of intensive cotton cultivation where the ratio of insect pollinators to flowers is lower. Reasonably accurate determinations of the percentage of hybrid plants can be obtained by examining a population of 1000 plants. Equally accurate results were secured by raising the seed in germinators, greenhouse benches or the field. In general, data on row and plant variation in natural crossing indicated a random distribution of values around the mean percentage obtained for a given locality. When exposed to similar sources of foreign pollen, varieties have been found to differ in the extent to which they are cross-fertilized. This fact may be of significance in the development of new breeding methods exploiting hybrid vigour. Bumble bees and honey bees proved to be the chief pollinators; the spread of methylene blue from a few flowers dusted with this dye may be used for the study of insect activity. An analysis of heterozygosity in advanced generations of an F_1 population at Knoxville, Tenn., indicated a higher percentage of heterozygous plants in the F_2, F_3 and F_4 generations than the theoretical expectation. The disparity may have been caused by natural selective processes favouring the heterozygous phenotype. Finally, the role of natural crossing in modern methods of breeding is briefly discussed (cf. *PBA*, Vol. XXIV, Abst. 1261).

1243 Glavinić, R.
Hibridizacija egipatskog i američkog pamuka oprašivanjem smešom polena. (**Using mixed pollen for cross pollinations between Egyptian and American cottons**).
Arh. poljopr. Nauk 1953 : **6** : No. 11 : 75–96.

In Macedonia, hybrids between *Gossypium barbadense* and *G. hirsutum* combining the high fibre quality of the one species with the earliness of the other have been developed. Descriptions are given of the F_1, F_2 and F_3 of a hybrid possessing the above properties. It was obtained by pollinating the Egyptian variety Maarad with a pollen mixture from the American varieties 78, 1308 and Foster.

1244 Babadžanov, F.
(**Improvements in the economic properties of cotton resulting from the use of mentors**).
Hlopkovodstvo (Cott. Raising) 1954 : No. 9 : 35–40. [Russian].

At the Institute of Cotton, the yields and fibre quality of S1470 and 138F were improved by pollinating with mixed pollen from several plants of their own variety, by training upon stocks of fine-fibre cottons such as 10964, or by a treatment combining both methods. The high-yielding variety 138F, however, showed a decrease in yield when grafted on to stocks of the less vigorous fine-fibre cotton 2525, although its fibre quality was improved by the mentor method.

1245 Moneva, G.
(**A study on pollination and fertilization of cottons**).
Zborn. zemjod. ispit. Inst. (Rep. Inst. agron. Res.)/Ann. Inst. Rech. agron. Skopje 1953 : **2** : 125–35. [Macedonian].

The percentage seed sets obtained in cross-pollination experiments at Skopje with both Macedonian and introduced material are given.

1246 Stephens, S. G.
Interspecific homologies between gene loci in *Gossypium*. I. Pollen color.
Genetics 1954 : **39** : 701–11.

By back-crossing the trispecific hybrid [AD_1/A_2D_5] of (*G. hirsutum* x *G. arboreum*) 6*n* x *G. raimondii* to *G. hirsutum*, evidence was obtained that the locus for pollen colour is carried in the A genome of the AD chromosome set of amphidiploid cottons. Possibly this locus is homologous with P_a in *G. arboreum* (cf. *PBA*, Vol. XI, Abst. 972). The amphidiploid species may also contain one or more P_b loci, the position of which is not yet known.

1247 Stephens, S. G.
Interspecific homologies between gene loci in *Gossypium*. II. Corolla color.
Genetics 1954 : **39** : 712–23.

Analysis of back crosses of (*G. hirsutum* x *G.*

arboreum) 6*n* x *G. raimondii* (cf. Abst. 1246) indicated that the main locus Y_1 for corolla colour in 2(AD) cottons is homologous with one of the loci for corolla colour carried by genome A. Reasons are given for inferring that the locus concerned is Y_c of the *G. arboreum* genome. Probably the locus Y_2 in the D genome of *G. barbadense* var. *darwinii* is also of the Y_c type. The apparent association between corolla colour and pollen colour in the genomes A, B and AD cannot be attributed to linkage since Y_c and P_a were found to be independent.

1248 McMichael, S. C.
Glandless boll in Upland cotton and its use in the study of natural crossing.
Agron. J. 1954 : **46** : 527–28.

In Upland cotton, lack of oil glands in the bolls, accompanied by a similar lack in the stem, hypocotyl and petiole, depends upon a completely recessive factor, *gl*. Several reasons are given for regarding the glandless-boll mutant as more suitable than Red Leaf for determining the percentage of natural crossing (cf. *PBA*, Vol. XXIV, Absts. 2220–1).

1249 Verderevskiĭ, D.
(Immunity of cotton from gummosis).
Hlopkovodstvo (Cott. Raising) 1954 : No. 9 : 46–51. [Russian].

Recent selections of immune material include types 2456 and 2457 from the Institute of Plant Industry and some hybrids obtained in Moldavia from the variety 8802.

1250 Bird, L. S.
Genetic-controlled carbohydrate and soluble nitrogen combinations in plant tissues causing resistance to the bacterial blight disease of cotton.
Plant Dis. Reptr. 1954 : **38** : 653–60. (Mimeographed).

Experiments on strains of Stoneville 2B and Deltapine suggested that reaction to bacterial blight depends upon a genetically determined physiological balance affecting the carbohydrate-soluble nitrogen balance. Growth of the causal bacteria, it is postulated, is inhibited by an unfavourable balance which arises either when the content of carbohydrates or N increases, with the other component remaining constant, or when both carbohydrate and N contents increase. The type of resistance studied was derived from Stoneville 20.

1251 Kublanovskaja, G. M. & Brailova, N. V.
(The effect of toxic substances in the sap of cotton plants upon their immunity from wilt).
Mikrobiologija (Microbiology), Moskva 1954 : **23** : 587–93. [Russian].

The immunity from *Fusarium* of the fine-fibred varieties 35–2, 504–V and 2525 and from *Verticillium* of the long-fibre variety 108F is associated with toxic substances in the sap. In susceptible varieties the toxins were present in small amounts, completely absent or absent during the later phases of plant development.

1252 Smith, A. L.
Problems on breeding cotton for resistance to nematodes.
Plant Dis. Reptr. 1954 : Suppl. No. 227 : 90–91. (Mimeographed).

Breeding for resistance to root-knot nematode at the Alabama Agricultural Experiment Station is discussed. Among commercial cottons, the new variety Auburn 56, derived from Cook 307, is superior in root-knot resistance and associated resistance to *Fusarium* wilt; it should prove useful in breeding. Data from crosses between the resistant form *Gossypium barbadense* var. *darwinii* and Upland suggest that resistance is inherited recessively and may be polygenic.

1253 Ermolaev, M.
(At the USSR Scientific Research Institute of Flax).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1954 : No. 10 : 43–44. [Russian].

New promising flax varieties bred at the institute include B4 and P9, which mature early, are resistant to lodging and produce fibre of high quality. B4 was selected from a land race from the Pskov province. Two other new varieties, P1 and P2, have been obtained by vegetative hybridization. They have longer stems and are more resistant to lodging than the standard I7.

1254 Friederich, J. C.
Zaaizaadvoorziening in verband met de rassenkeuze en de weersomstandigheden bij de teelt van vezelvlas. (**The supply of seed for sowing in relation to the selection of varieties and weather conditions in the cultivation of fibre flax**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1954 : **11** : 48–49.

Tabulated data summarizing the results of variety trials conducted at Wageningen from

1950 to 1953 are presented; during this period Wiera has superseded Concurrent as the variety most widely cultivated in the Netherlands.

1255 Arif, A. G.
A study of physiologic specialization of the flax rust, *Melampsora lini*.
Trans. Brit. mycol. Soc. 1954 : **37** : 353–61.

By means of 17 differential flax varieties, 32 collections of *M. lini* from the United Kingdom and Pakistan were found to consist of 17 races, including a few North American and European races and nine not previously described. The reactions of the differential varieties to the various cultures were similar when 10-day-old and 30-day-old plants were inoculated according to the techniques of Straib and Flor. When tested under greenhouse conditions the fibre varieties commonly grown in the United Kingdom were susceptible to all the races isolated. The following imported fibre flaxes were immune or highly resistant to all races in greenhouse tests: Tekstilščik [Textile Worker], Stahanovec [Stahanovite], USSR 2, Wada and 1288/12. Varieties susceptible in greenhouse tests were also susceptible in the field when inoculated with the same races at various stages before flowering, but were resistant if inoculated after flowering.

1256 Flor, H. H.
Identification of races of flax rust by lines with single rust-conditioning genes.
Tech. Bull. US Dep. Agric. 1954 : No. 1087 : Pp. 25.

In flax a gene-for-gene relationship exists between resistance in the host and virulence of the rust pathogen (*Melampsora lini*), resistance being invariably dominant and virulence usually recessive (cf. *PBA*, Vol. XXIV, Abst. 1273). The author gives an account of the investigations which have led to the development of a new series of 18 differential varieties each carrying one dominant gene for resistance; the varieties were chosen for their efficiency in differentiating North American races. Details of the techniques involved in racial identification and infection types are included; a key to the races and reactions of the differentials is provided. The author stresses the value of the genetically simple differentials in breeding for resistance and in determining the role of hybridization and mutation in the origin of new races of the pathogen.

1257 Inouye [Inoue], C.
(Meiosis in jute).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 278–81. [Japanese].

A description of meiosis in *Corchorus capsularis* is given, and includes a discussion of the mechanism of transfer of chromatin from the nucleolus to the chromosomes.

1258 Tamargo, M. A. & Jones, M. D.
Natural cross-fertilization in kenaf.
Agron. J. 1954 : **46** : 456–59.

Under Cuban conditions, natural crossing of lines grown in alternate rows in 1951–52 varied from 1·79% in Java IX51 to 23·76% in IX88A, with an average of 7·21% for the six strains tested. In the season 1952–53, natural crossing of lines grown in alternate rows ranged from 2·52% in Cuba 797 to 11·07% in IX108, with an average of 7·86%. Natural crossing in the same lines when grown as alternate plants during 1952–53 varied from 1·79% in Cuba 797 to 18·32% in IX108. When IX108 was grown in alternate rows and in an alternate-plant arrangement with XIII3, 32·50% and 44·51% natural hybridization occurred respectively. It is suggested that the percentage of natural crossing might be considerably increased if compatible varieties with similar maturities were grown in areas where large populations of the honey bee, the chief pollinator, were present.

1259 Jones, M. D. & Tamargo, M. A.
Agents concerned with natural crossing of kenaf in Cuba.
Agron. J. 1954 : **46** : 459–62.

The honey bee (*Apis mellifica*) proved to be the chief agent of pollination and its foraging habits when visiting kenaf flowers are described in detail (cf. Abst. 1258). The wasp *Campsomeris trifasciata* was found to be a good pollinator but it only worked the flowers late in the season when nectar from other sources was in short supply.

1260 Summers, T. E.
Physiologic specialization of *Colletotrichum hibisci* Poll. on kenaf.
Plant Dis. Reptr. 1954 : **38** : 483–86. (Mimeographed).

Three races of *C. hibisci* were identified in Florida. The lines BG–52–18 and BG–51–4 are sufficient to identify these races, but use of a set of seven differentials, including these two lines, is recommended for the identification of other possible races. All the lines tested were

attacked by race 2 but the reaction of some was intermediate; tests are to be carried out on a wider range of material in an attempt to discover a higher degree of resistance.

1261 Crandall, B. S. & Lynn, H. D.
The resistance of kenaf varieties, hybrids, and relatives to anthracnose.
Plant Dis. Reptr. 1954 : **38** : 311–13. (Mimeographed).

Investigations in Cuba have suggested that resistance to *Colletotrichum hibisci* in kenaf (*Hibiscus cannabinus*) is controlled by more than one pair of recessive genes.

1262 Kuwada, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. VII. On the influence of length of photoperiod on growth, flowering and fruit setting).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 235–38. [Japanese].

Further to his series of investigations on the amphidiploid *Abelmoschus esculentus* x *A. manihot* (cf. *PBA*, Vol. XXIII, Abst. 2847), the author records the effects of short, normal and long photoperiods on the development of the amphidiploid and the parent species. The amphidiploid was tallest and had the longest flowering period under all photoperiodic conditions.

1263 Kuwada, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent species. VIII. On the germination of seeds stored in a dry state).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 180–84. [Japanese].

The poor germination of the amphidiploid of *Abelmoschus esculentus* x *A. manihot* when stored dry (cf. *PBA*, Vol. XXIV, Abst. 1284) appears to be due to defective water-absorbing capacity caused by the structure of the testa.

1264 Kuwada, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. I. Drought resistance).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1953 : **22** : 1–2. [Japanese].

The amphidiploid of *Abelmoschus esculentus* x *A. manihot* is more susceptible to drought than either parent. This greater susceptibility is associated with a less concentrated cell sap, a lower resistance to the toxic effects of $KClO_3$ and a lower transpiration rate than either of the parents.

1265 Kuwada, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. X. On the temperature required for the germination of the seed).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1953 : **22** : 3–4. [Japanese].

The minimum, optimum and maximum temperatures at which the amphidiploid of *Abelmoschus esculentus* x *A. manihot* germinates are approximately equal to the corresponding temperatures for *A. esculentus*.

SUGAR AND STARCH PLANTS

1266 **Distribution of plant cane.**
S. Afr. Sug. J. 1954 : **38** : p. 701.

The variety N:Co. 376, now to be distributed, is briefly described (cf. *PBA*, Vol. XXIII, Abst. 1345). It is widely adapted and has proved equal or slightly superior to N:Co. 310 in sucrose yield per acre. A characteristic pale blotch on its leaf is a useful means of identification. The variety appears to be fairly resistant to mosaic and has remained free from smut and red rot.

1267 Hebert, L. P.
The Louisiana sugarcane variety census for 1954.
Sug. Bull., N. Orleans 1954 : **32** : 388–89, 393.

The results of a variety survey in Louisiana are summarized. CP44/101 occupied the highest percentage of the total sugar acreage, followed by CP36/105 and CP44/155.

1268 Hughes, C. G.
The variety Q.28.
Cane Gr. quart. Bull. 1954 : **18** : 46–47.

Attention is drawn to the merits of the Queensland sugar cane Q28 (Co.290 x Q1098); the problem of its susceptibility to ratoon stunting can be easily overcome by the provision of healthy planting material.

1269 **Annual Report of the Sugarcane Breeding Institute, Coimbatore, for 1952-53** : Pp. 174.

The full report of the cytogenetical and breeding

investigations carried out at the above institute and at the Karnal substation is presented. This work has already been referred to in a summary of a section in the relevant annual report of the Indian Central Sugarcane Committee (cf. *PBA*, Vol. XXIV, Abst. 3183).

1270 D'Emmerez de Charmoy, D.
Études sur de nouvelles variétés de canne à sucre à l'Ile de la Réunion. (**Studies on new varieties of sugar cane in Réunion Island**).
Rev. agric. Réunion 1954 : **54** : 107–17.
This is the second part of an article reviewed in Abst. 417. Data on the yield and sugar content of local varieties are presented, together with information on foreign varieties recently introduced into the island.

1271 L., H. M.
Cane agriculture in Mauritius.
Int. Sug. J. 1954 : **56** : p. 179.
This short account of the sugar cane industry in Mauritius includes notes on breeding aims, variety trials and varietal differences in resistance to disease.

1272 L., H. M.
Sugar cane breeding in the West Indies.
Int. Sug. J. 1954 : **56** : 273–74.
A brief description of the current breeding programme at the Central Sugar Cane Breeding Station, Barbados, is followed by an account of the pedigrees of the B52′ and B53′ series and of progress made by the B47′, B49′, B50′ and B51′ series. The distribution of varieties in the British West Indies is also outlined.

1273 **Annual Report of the Research Department of the Sugar Manufacturers' Association (of Jamaica) Limited, 1953** : Pp. 76.
The report includes a section describing trends in the commercial use of sugar-cane varieties in Jamaica and the main results of the 1953 variety tests. In tests under commercial conditions, B41227, B42231 and B4362 gave the highest production of sugar per acre. Initial tests were also carried out on canes belonging to the more recently developed series of Barbados canes. Another section provides information on the incidence of ratoon stunting, chlorotic streak, eye spot (*Helminthosporium sacchari*) and other diseases upon commercial canes. Appendix I contains tables giving information on variety performance and distribution and on other aspects of commercial production. Appendix II includes detailed summaries of the results of the variety trials and variety x fertilizer experiments on the estates.

Sugar Bulletin of the Department of Agriculture, British Guiana, 1954 : No. 22 : Pp. 75.

1274 *Birkett, L. S. & Cameron, C. Field experiments with sugar cane, XXII.* (*pp. 1–39*).
Details are given of the performance of standard canes and of Barbados and Demerara seedlings during 1953. The following canes are recommended for planting, according to the soil type: B41227 (B35207 x POJ2878), B37161 (B3365 x B603), B4098 (B3439 x Co. 290), D37/45 (B34104 x Co. 331), B4373 (B3354 x Co. 290), B46378 (B35247 x B3337), B4362 (B37161 x POJ2878) and B43413 (MD47 x Co. 290).

1275 *Birkett, L. S. The variety and fertilizer position of the sugar industry, XIX.* (*pp. 55–65*).
Information on the commercial yields of varieties in 1953 and on the variety position in British Guiana is provided.

1276 *Spence, J. A. Sugar cane diseases in British Guiana.* (*pp. 73–75*).
Tables are given summarizing the reactions of a large number of breeding canes and potentially commercial seedlings to leaf scald; many fall into the resistant category. Preliminary experiments suggest a relationship between leaf-scald resistance and high aminoacid content.

1277 Brett, P. G. C.
***Saccharum-Miscanthidium* hybrids.**
J. Genet. 1954 : **52** : 542–46.
"Several hundred seedlings were obtained after pollination of four sugar-cane clones by *Miscanthidium violaceum*. Morphologically these seedlings closely resemble sugar-cane, but an awned fertile lemma, not normally present in POJ2725, was found in most of its hybrids. Some of the seedlings flowered during March and April, several months after the end of the sugar-cane flowering season. The hybrids themselves are unlikely to be of commercial value, but may prove of use in further breeding work."
[Author's summary].

1278 Warner, J. N.
Colección mundial de variedades de caña de azúcar. (**World collection of sugar-cane varieties**).
Bol. Asoc. Téc. azuc. Cuba 1954 : **13** : 387–89.
Further reference is made to this collection (cf. *PBA*, Vol. XXIV, Abst. 502), which has now

been established at the Interamerican Institute of Agricultural Sciences at Turrialba.

1279 B., J. H.
Wild canes in captivity.
Cane Gr. quart. Bull. 1954 : **18** : 53–54.

In order to control their stoloniferous growth, forms of *Saccharum spontaneum* are confined to concrete pens in the collection of *Saccharum* species maintained for breeding purposes at the Meringa station, Queensland.

1280 Ikehata, Y.
(**Studies on the drought resistance of sugar cane. III. On the drought resistance of sugar cane varieties and differences in the power of maintaining root pressure**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 52–53. [Japanese].

Six varieties were compared in respect of their capacity for maintaining root pressure over several days when (1) the soil was irrigated and (2) irrigation was discontinued. Drought resistance was correlated with maintenance of root pressure when the soil was allowed to dry out but not when the soil was irrigated.

1281 **Strains of sugar beet.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1954 : No. 5 : Pp. 4.

The leaflet gives brief descriptive notes on the chief strains available in Britain.

1282 Margara, J.
Problèmes que pose l'amélioration de la betterave sucrière en France. (**Problems that arise in the improvement of the sugar beet in France**).
Ann. Inst. nat. Rech. agron., Paris 1954 : Sér. B : **4** : 147–95.

Progress achieved over the past four decades in France and abroad in the breeding of new varieties of sugar beet is surveyed, special attention being paid to problems arising from the introduction of foreign varieties into France. Many American, German and Italian introductions, although valuable because of their resistance to *Cercospora*, which causes losses in yield of up to 50% in certain parts of France, are susceptible to bolting, are unsuitable for mechanical harvesting, and give lower yields than many other varieties when the disease is not present. The Central Station of Genetics and Plant Breeding at Versailles has therefore recently initiated a programme designed to increase the yields and, in certain cases to improve the cultural qualities, of *Cercospora*-resistant lines; as wide a range as possible of initial breeding material has been chosen to avoid loss of vigour due to lack of genetic variability through inbreeding. Other breeding aims include the development of varieties resistant to yellows by means of interspecific crosses with *Beta maritima*, *B. patellaris* and *B. lomatogona*; a more intensive study of the problem of resistance to bolting; and the development of monogerm and polyploid varieties and of F_1 crosses of inbred lines to exploit hybrid vigour. It is thought that the low root yield of varieties with a high sugar content may be partly due to paucity of genes determining vigour. A wider range of initial parent material in breeding for high sugar content might therefore be advantageous.

1283 Keller, E. R. & Rapin, J.
Sortenprüfung bei Zuckerrüben 1949–1953. (**Varietal trials of sugar beet, 1949-53**).
Mitt. schweiz. Landw. Zürich-Oerlikon 1954 : **2** : 117–21.

In trials conducted at the Federal Research Stations at Zürich-Oerlikon, Liebefeld-Bern and Lausanne from 1949 to 1953, Kleinwanzleben E gave the highest yields of roots and sugar per given area; it had, however, a comparatively low sugar content and proved susceptible to leaf spot. Kleinwanzleben Polybeta gave good yields of root with a high sugar content.

1284 Fedorov, A. I.
(**Intervarietal sugar-beet hybrids**).
Agrobiologija (Agrobiology) 1954 : No. 4 : 41–44. [Russian].

At Umanj, nonbolting high-sugar hybrids yielding 4–5 c. more sugar per ha. than their maternal parents were obtained from direct and reciprocal crosses between a Z sugar beet V1612 and such drought-resistant and nonbolting E varieties as R632 and U751.

1285 Petrunja, M. I.
(**Selective fertilization in sugar beet**).
Agrobiologija (Agrobiology) 1954 : No. 5 : 29–36. [Russian].

Plants of the mangel Eckendorf Yellow were sown in juxtaposition with plants of various sugar-beet varieties and the two allowed to interpollinate. The progeny of the mangel contained 49–55% of plants of purely maternal type, the proportion being greater when the pollen parent was a high-sugar type than when it was an E type. Some plants of the sugar-beet type occurred, together with a number of new forms; some of these were morphologically like sugar beet but differed in sugar content and root weight and are regarded as hybrids in which the

maternal properties had been swamped. The progenies of the sugar beets contained only 36–39% of plants of maternal type and 60–63% of hybrids, with hardly any plants of paternal type. From these experiments it is concluded that both mangel and sugar beet exert a selective preference for mangel pollen. When plants of sugar beet or mangel were emasculated and pollinated with a mixture of pollen from ten plants of the same variety, all the progeny were of the maternal type; if the pollen of one other variety was added, 12·2% of hybrids occurred in the case of mangel and 37·6% in sugar beet. In the converse case, using pollen of 10 plants of another variety plus one plant of the same variety, the mangel progenies contained 65·4% hybrids and the sugar beets 75·8%. A mixture of pollen from 5 mangel plants and 5 sugar-beet plants produced 36·2% hybrids in the mangel progenies and 64·5 in the sugar beet. Application of foreign pollen 30 minutes after self pollen produced 29·4% hybrids in the mangel progenies and 26·3% in the sugar beet; reversing the order of application gave 51·2 and 66·7% respectively. Crosses of mangel with pure sugar beet pollen produced 95·1% hybrids and the reciprocals 97·0%; the few seedlings of maternal type are again ascribed to swamping inheritance; in the progenies from sugar beet they had a higher root weight and lower sugar content than the original variety, whereas those from mangel had a lower root weight and higher sugar content.

All crosses in which the mangel served as pollen parent had heavier roots than the reciprocal crosses.

1286 Uzunov, V. N.
(The sugar content and yields of monogerm sugar beets).
Sahar. Promyšl. (Sug. Industr.) 1954 : No. 4 : 39–42. [Russian].

The results of recent state varietal trials, in which monogerm varieties were included for the first time, are presented. The performance of the multigerm standards has so far been higher than that of the monogerm varieties.

1287 Rakitjanskiĭ, V. K.
(Technological properties of sugar beet varieties).
Sahar. Promyšl. (Sug. Industr.) 1954 : No. 5 : 34–36. [Russian].

It is suggested that trials be conducted to determine the comparative suitability of different varieties from the technological point of view. Some varieties, e.g. P232, have given high yields in the Kubanj but waste in the refining process has been too high.

1288 Drachovská-Šimanová, M.
(Testing sugar beet varieties for their resistance to *Cercospora*).
Za socialist. seljskohozjaĭstv. Nauk. (For socialist agric. Sci.), Praha 1954 : **3** : 262–75. [Russian].

In Czechoslovakian trials the Polish varieties CLR and MLR showed the highest degree of resistance to *C. beticola*. They were, however, less adapted to the cold and humid conditions of some districts than the resistant Czechoslovakian varieties Dobrovice C, Voganka and Zapotil, which are characterized by a shorter growth period.

STIMULANTS

1289 Giovannozzi, M.
In tema di selezione dei tabacchi. **(On the theme of tobacco breeding).**
Tabacco, Roma 1954 : **58** : 243–63.

In an historical review of the application of genetics to tobacco breeding, reference is made to various useful mutants, the use of polyploidy in obtaining fertile hybrids, and the important work of selection and hybridization carried out by a series of Italian tobacco breeders; the results include the production of *Nicotiana rustica* selections with high nicotine content, lines of American tobaccos of improved quality, improved forms of tropical, subtropical and oriental tobaccos, and tobaccos resistant to diseases such as mosaic and *Thielaviopsis basicola*. A brief review is also given of work carried out in the USA and certain other countries on breeding disease-resistant tobacco varieties.

1290 Pal, B. P. & Deshmukh, M. J.
A note on some improved types of *hookah*-tobacco (*Nicotiana rustica* L.).
Indian J. Genet. 1954 : **14** : 44–46.

The selections NP 214, 219, 220 and 222 were developed from a cross between NP 18 and introductions from North America at the Indian Agricultural Research Institute, New Delhi. Brief descriptive notes are given on these selections and on the parent NP 18.

1291 Bolsunov, I.
La création de variétés de tabac sans bourgeons axillaires et sa réalisation pratique. **(The production of tobacco varieties without axillary buds and its practical realization).**
Rev. int. Tabacs. 1954 : **29** : 147–53.

The practical value of breeding varieties that

do not form lateral shoots when topped is emphasized and a summary of the author's investigations on this character over the past twenty years is given. Examination of large numbers of plants of different species of *Nicotiana* from all parts of the globe failed to reveal the existence of any type deficient in lateral shoots; nor were attempts to induce mutations deficient in this character by X irradiation successful. It is concluded that several independently inherited genes are involved and that, for this reason, the possibility of developing strains free from laterals by line selection must also be discarded, especially in view of the strong influence exercised by external environmental conditions. Hybridization is considered the only practical method of approach and three possibilities are discussed: (1) crosses between those varieties, such as slow-growing strains and late strains with large leaves, which do not form vigorous side shoots; (2) crosses between varieties genetically dissimilar in the hope of producing hybrids with an accumulation of genes favouring a decrease in the number and vigour of lateral shoots; and (3) crosses between different subspecies which may give rise to new forms lacking the ability to develop laterals. Crosses effected at the Austrian Tobacco Breeding Station, Fürstenfeld, between an Ethiopian strain of *N. rustica* and *N. rustica* var. *humilis* have given F_2 and F_3 generations in which some plants were completely deficient in laterals. The F_1 of Géant 30 [Giant 30] x Ungarischer Riese [Hungarian Giant] and of Burley 21 x Géant 30 also contained plants with fewer lateral shoots than the parental forms.

1292 Borozdina, A. S.

(Moisture-retaining properties of tobaccos).

Tabak (Tobacco) 1954 : No. 3 : 39–40. [Russian].

A high moisture content was found in some introduced varieties, besides the Soviet tobaccos of the Dubec group and some strains of Trapezond and Ostrokonec [Pointed-end].

1293 Širjaev, A. I.

(Evaluation of the quality of the tobacco variety Ostrolist 2747).

Tabak (Tobacco) 1954 : No. 4 : 51–53. [Russian].

Data on the smoking quality and technological properties of the new high-yielding, large-leaved variety Ostrolist 2747 [Pointed Leaf 2747] are presented.

1294 Bolsunov, I.

Méthodes de la sélection de tabacs très pauvres et riches en nicotine. (**Methods of breeding tobacco varieties with a low or high nicotine content**).

X. Internat. Kong. land- u. ernährungsw. Industr., Madrid 1954 : Pp. 23.

The breeding of varieties for high or low nicotine content at the Austrian Tobacco Breeding Station, Fürstenfeld, the Tobacco Institute, Forchheim, Germany, and at various research stations in the USA is surveyed. There appear to exist two sets of genetic factors controlling the inheritance of nicotine and nornicotine, those that control total alkaloid production and those that control the change of nicotine in the leaf to nornicotine. If possible, factors for both low nicotine content and for rapid decomposition of nicotine into nornicotine should be combined in breeding new strains for the tobacco industry; Geudertheimer and Havana III, both bred at Forchheim, appear to possess these qualities.

Various methods of breeding new varieties with a low nicotine content are discussed. Individual plant selection within a given variety, interspecific hybridization between cultivated varieties on the one hand and wild species with a low nicotine content on the other, and the induction of mutations all offer possibilities. In the opinion of the author, however, the best results are to be obtained from crosses between different subspecies of *Nicotiana tabacum* from widely separated geographical localities, whereby an accumulation of genes favouring low nicotine content may be expected to result in plants containing less nicotine than either parent. At Fürstenfeld, crosses between gigas varieties and varieties with a low nicotine content have given interesting results in this respect.

In breeding tobaccos designed for the industrial extraction of nicotine, the following methods are suggested: (1) improvement by individual selection of varieties already possessing a high nicotine content, (2) hybridization of varieties and subspecies from different geographical localities, (3) hybridization between varieties already rich in nicotine, in the expectation that an accumulation of genes for high nicotine content will result and (4) induction of polyploidy in tobaccos with a high nicotine content, followed by individual plant selection and hybridization.

1295 Bolsunov, I.
Züchterische Methoden für die Schaffung nikotinarmer und nikotinreicher Tabake. (**Breeding methods for the development of tobacco varieties with a high or low nicotine content**).
Fachl. Mitt. öst. Tabakregie 1954 : No. 2 : 17–31.
This is the German version of the article summarized in Abst. 1294.

1296 Burcev, Ju. A.
(**Questions of standardization of *Nicotiana rustica* varieties on collective farms in the Ukraine**).
Tabak (Tobacco) 1954 : No. 3 : 19–20. [Russian].
In the northern tobacco growing districts, Vysokoroslaja Zelenaja 317 [Tall Green 317] is outstanding in yield, leaf quality and resistance to tip chlorisis and bacterial spot, and is as resistant to scorching as Hmelovka. Mention is made of the new variety Vysokoroslaja 12/12 [Tall 12/12], which was developed at the Institute of Tobacco and surpasses all other varieties in resistance to bacterial spot; in quality it is intermediate between Hmelovka and Vysokoroslaja Zelenaja 317. In the central districts Hmelovka, though susceptible to tip chlorosis, outyields Vysokoroslaja Zelenaja 317. It is hoped that both these varieties will be superseded by new resistant types such as MR12 and Egiza 1949, which combine high yield and good leaf quality. MR12 also shows resistance to scorching. Gollandka 19/17 [Holland 19/17] and Hmelovka 125 proved to be the varieties most suited to the arid climate of the southern Ukraine.

1297 Moore, E. L., Todd, F. A. & Clayton, E. E.
Resistant tobacco today and tomorrow.
Res. & Fmg. 1953 : **11** : Nos. 3–4 : 6–7.
Progress in North Carolina in breeding different types of tobacco resistant to one or more of the diseases Granville wilt, blackshank and mosaic is surveyed in a popular manner.

1298 Berbeć, J.
Zdrowotność tytoniu (*Nicotiana tabacum* L. i *N. rustica* L.) w latach 1949–1951 w Puławach. [**The health of tobacco (*N. tabacum* L. and *N. rustica* L.) at Puławy during the years 1949-1951**].
Roczn. Nauk rol. 1953 : **66** : Ser. A. : No. 2 : 53–98.
Field observations were made on a great number of varieties, Polish and foreign, and of varietal hybrids in relation to susceptibility and resistance to diseases.
It was found that crosses of Virginia Joyner with varieties of the oriental type, by the rapid and abundant production of rootlets, inhibited the adverse effects of *Thielaviopsis basicola* on growth and development. Varieties with a short vegetative period, for example, oriental varieties, were less severely attacked by *Th. basicola* and by virus diseases. Varieties with a long vegetative period, e.g. those of American origin, excepting cigar tobaccos, were severely infected by *Th. basicola* and by bacterial and virus diseases. Amongst the cigar tobaccos and varieties of European origin, attack by diseases was markedly weaker.

1299 Lucas, G. B. & Todd, F. A.
Resistance to black shank of certain flue-cured tobacco varieties in seedling and transplant stages.
Plant Dis. Reptr. 1954 : **38** : 502–04. (Mimeographed).
Seven varieties and strains were tested for their resistance to blackshank (*Phytophthora parasitica*) in the seedling and transplant stages at the North Carolina State College. Strain T x L (tetraploid *Nicotiana tabacum* x *N. longiflora*) was highly resistant at both stages. Oxford 1, variety 400 and TL106, a wild-fire immune selection from (*N. tabacum* x *N. longiflora*) x *N. tabacum*, were highly susceptible in all tests. Dixie Bright 101 and Dixie Bright 102 were more resistant at both stages than Oxford 1 and 3, although in field resistance these four varieties are comparable. Possibly the two Dixie Bright types carry accessory genes derived from their bacterial-wilt resistant parent TI448A.

1300 Tugade, P. P.
The Simmaba tobacco, its origin and contribution to the Philippine tobacco industry.
Philipp. J. Agric. 1953 (1954) : **18** : 75–83.
Selection 28, one of the few survivors of a severe outbreak of *Fusarium* wilt in 1930, was chosen for further work because of its desirable leaf qualities and apparent wilt resistance. It is thought to be a hybrid between a Philippine and a Sumatra variety. From its varied progeny, which showed good wilt resistance when grown under shade, three strains were finally selected. No. 1, named Simmaba [Banana-leaf], the most valuable strain, is a multiple purpose, wilt-resistant type resembling

selection 28 in leaf characters. No. 2, an early-maturing Sumatra type, and No. 3, a filler tobacco resembling the local variety Don Juan, are less wilt resistant than No. 1.

1301 Graham, T. W.
Problems in breeding for resistance to nematodes in tobacco.
Plant Dis. Reptr. 1954 : Suppl. No. 227 : p. 89. (Mimeographed).

In investigations at the South Carolina Agricultural Experiment Station, genetic factors controlling resistance to root-knot nematode have appeared to be very closely linked with some commercially undesirable properties in flue-cured tobacco. Even a compromise type between a medium level of resistance and somewhat altered quality has not been satisfactorily stabilized. Resistance seems to be conditioned by multiple genes; numerous environmental factors also influence root-knot development. In view of the difficulty of keeping field plots uniformly infested for the purpose of critical selection, use has been made of greenhouse plantings and advanced lines showing more promise with respect to stabilized resistance have been developed.

1302 Wallace, A. T.
An association between narrow leaves and root-knot nematode resistance in flue-cured tobacco.
Agron. J. 1954 : **46** : 468–69.

"Selection of wide-leaved root-knot nematode resistant varieties of flue-cured tobacco has been hindered by a close association of high resistance and narrow leaves. It was found that the genotypic correlation between narrow leaf width and nematode resistance was 0·30. Other genotypic correlations show no association between leaf length and nematode resistance, but a positive correlation, 0·32, between leaf length and leaf width. The variance components tend to indicate that the genotype-year-location interaction is relatively unimportant and that the genotype-year interaction may not be large. The genetic variances estimated indicate that wide-leaved nematode resistant strains probably can be isolated." [Author's summary].

1303 Eden, T.
Morphological basis of quality of tea.
Nature, Lond. 1954 : **174** : p. 844.

Wight and Barua recently reported a correlation coefficient of 0·76 between hairiness and a taster's evaluation and a correlation coefficient of 0·493 between pigmentation and hairiness (cf. *PBA*, Vol. XXIV, Abst. 3219). The present writer criticizes the predictive value of these coefficients, on the grounds that the correlation coefficient is not equally sensitive throughout its range to differences in degree of association. Using the function $1 : \sqrt{1-r^2}$, predictability indices of 0·35 and 0·13 are calculated for the correlation coefficients of 0·76 and 0·493, respectively.

1304 **Nineteenth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi, Tanganyika Department of Agriculture, 1952** (1954) : Pp. 36.

Tables are given summarizing the results obtained in 1952 and previous years from the clonal and seedling selection trials in progress and from experiments comparing clones and seedlings derived from the same mother-trees.

1305 Antunes Filho, H. & Carvalho, A.
Melhoramento do cafeeiro. VII. Ocorrência de lojas vazias em frutos de café "Mundo Novo." (**Improvement of coffee. VII. Occurrence of empty locules in fruits of Mundo Novo coffee**).
Bragantia 1954 : **13** : 165–79.

The production of fruits with an empty locule is characteristic of the coffee variety Mundo Novo and its progenies; in some progenies over 30% of the fruits had empty locules, whereas in others the amount was less than 12%; about 4% of the progenies belonged to the high group and 47% to the low group, the remaining 13% being intermediate; some progenies were entirely free from the defect. The characteristics of the different progenies remained fairly constant in successive years and would seem to be determined genetically. No correlation was observed between proportion of empty fruits and yielding ability.

1306 Braudeau, J. & Burle, L.
Le cacao sa production en Équateur, Colombie et au Costa-Rica. (**Cocoa production in Ecuador, Colombia and Costa Rica**).
Bull. agron. Fr. d'out. mer. 1954 : No. 9 : Pp. 59.

This survey of cacao cultivation in Ecuador, Colombia and Costa Rica was prepared by a mission sent to these countries by the Ministry of French Territories Overseas and includes a brief mention of types grown, the results of clonal trials at various centres and differences between clones in degree of susceptibility to witches' broom.

1307 Renaud, R.
Les maladies à virus du cacaoyer de l'Ouest africain. (**Virus diseases of cacao in West Africa**).
Agron. trop., Nogent 1954 : **9** : 517–43.
This account of the different virus diseases attacking cacao in French West Africa includes a brief mention of research work on resistance to swollen shoot. All the local Trinitario and Amelonado clones examined were susceptible, but young plants of *Theobroma mariae* and *T. bicolor* from the Upper Amazon proved highly resistant.

Annual Report of the Department of Hop Research, Wye College, 1953 : Pp. 72.

1308 *Beard, F. H. & Jary, C. L. The new varieties of hops.* (*pp. 29–40*).
New varieties are discussed from the aspects of (1) their suitability as substitutes for American hops, (2) tolerance of *Verticillium* wilt, (3) hops with higher ranges of valuation as substitutes for Fuggle and (4) machine picking. The characteristics of the more acceptable varieties are described; notes are also given on the varieties not now in demand.

1309 *Neve, R. A., Farrar, R. F. & Salmon, E. S. Plant breeding section. Review of the year's work.* (*pp. 41–45*).
Material from the Wye/East Malling Research Station joint breeding project was selected for wilt tolerance, resistance to downy mildew, yield and the richness and aroma of the cones. Seedling families from crosses of Nonsuch (OB53) with wilt-tolerant males were established (cf. *PBA*, Vol. XXIII, Abst. 2894). Triploids of Brewer's Gold and Bullion, produced by open pollination of tetraploids and now in their second season, yielded well and were very vigorous; their cones were practically seedless and were highly resistant to shattering. Most of the triploids were superior to the parent varieties in percentage of α resin. The 4*n* form of Bullion was crossed with six wilt-tolerant males. Open-pollinated 3*n* seedlings of Eastwell Golding were raised; a controlled cross was made between the tetraploid of this variety and the male hop OB21. Work was continued to discover any relationship between number of resin glands on the anthers of the male hops and the amount of resin in the cones of related female hops.

1310 *Salmon, E. S. The challenge cups for new varieties of hops.* (*pp. 46–47*).
The results of the 1953 competition among growers are presented.

1311 Méneret, G., Bonnat, M. & Guiolet, J.
Forme des bractées chez les houblons cultivés. (**Bract shape in cultivated hops**).
Ann. Inst. nat. Rech. agron., Paris 1954 : Sér. B : **4** : 209–46.
An investigation into the length/breadth ratio of the bracts of hops cultivated in France is presented. The results of this research, which was carried out by the Plant Breeding Station at Dijon, indicate that shape of bract is a reliable method of varietal identification and useful as a means of verifying the homogeneity of commercial fields. Three principal groups of hops are distinguished, with narrow, intermediate and broad bracts, respectively.

1312 **Institute of brewing hop trials: 1952 crop.**
J. Inst. Brew. 1954 : **60** : 414–19.
The new varieties 1147, C2, D1, D3 and OT48 were tested as "copper hops" on a commercial scale; all these varieties are tolerant of *Verticillium* wilt. With the exception of D3, they were also tested in a miniature brewery at the Brewing Industry Research Foundation. The results of the two series of trials were in close agreement. D1 showed most promise as copper hops and also for dry-hopping pale ales. OT48, C2 and D3 were considered to be useful varieties, although the reports received were not all favourable.

MINOR CROP PLANTS

1313 Boev, I.
(**The reserves for an increased production of vegetable oils in our country**).
Zemledelie (Agriculture) 1954 : No. 8 : 78–85. [Russian].
Oil plants made standards in 1954 include the following varieties (cf. *PBA*, Vol. XXII, Abst. 2920).
Winter rape. Dubljanskiĭ and Janeckiĭ are notable for good seed yield and high oil content.
Sesame. Belosemjannyĭ 7 [White-seeded 7] is described as a high-yielding oil type.
Linseed. Karabalyk 3 yields 0·6–1·1 c. more seed per ha. than Udžan and has a 0·4–0·9% higher oil content. Bahmaljskiĭ 1056 combines a growth habit suitable for mechanical harvesting with a yield and oil content as good as those of Buharskiĭ 32.
Sunflower. Armavir 3497, VNIIMK 8931 [Institute of Oil Plants 8931], Zelenka 368 and Šortanda 41 are interesting for their yields, high oil contents and resistance to *Orobanche*.

Groundnut. Krasnodar 1708 and VNIIMK 1657 are distinguished by their earliness and Taškent 32 has proved more productive and 3–5 days earlier than Perzuvan 46/2.

1314 Valle, O.
Kokemuksia syysrypsilajikkeittemme viljelyvarmuudesta. (**Observations on the reliability under cultivation of our autumn rape varieties**).
Maatalous 1954 : **47** : 79–82.

An account is given of comparative trials in Finland of the German varieties Gruber and Lembke and the Swedish Rapido. Data are provided on seed and oil yield. Neither Gruber nor Rapido showed any significant superiority over the other. Lembke has a shorter growing period, and has possibilities in regions where late spring frosts are general.

1315 Rives, M.
Le système de reproduction du colza. Sa signification du point de vue de la théorie polygénique de l'hérédité des caractères quantitatifs. (**The reproductive system in colza. Its importance from the point of view of the theory of the polygenic inheritance of quantitative characters**).
Ann. Inst. nat. Rech. agron., Paris 1954 : Sér. B : **4** : 21–31.

The concept of the inheritance, variability and selection of balanced polygenic combinations of additive genes in a population subjected to natural selective pressures is discussed with particular reference to *Brassica napus*. The views expressed tally in the main with those of Mather (cf. *PBA*, Vol. XIII, Abst. 378) and Wigan (cf. *PBA*, Vol. XIV, Abst. 1058). The variability of a population and its ability to adapt itself to a changing environment depend upon the gradual liberation through segregation of the accumulated potential variability that has arisen as the result of past mutations; the rate at which these genetic reserves are released is controlled by the arrangement of the polygenes in the chromosome and is regulated by linkage between the polygenes which helps to conserve genetic variability.

1316 Togari, Y. & Kanno, C.
(**On the sensitivity of rape varieties to temperature and illumination**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 47–49. [Japanese].

A comparative study of a series of Japanese varieties showed that varieties with the most pronounced spring habit responded most markedly to temperature and required the shortest period of low temperature during differentiation of the flower-bud initials. Illumination had little effect on vegetative period.

1317 Sauger, L. & Tardieu, M.
La collection des ricins de Bambey. (**The castor-oil plant collection at Bambey**).
Bull. agron. Fr. d'out. mer 1953 : No. 11 : 101–10.

The possibility of cultivating castor-oil plants on a commercial scale in Senegal is discussed with reference to the collection at the Bambey Agronomic Research Centre. Morphological data, including information on fruit size and shape, are presented for the varieties Ségon 1 and R1, 2, 3, 16, 20, 25, 28 and 34, together with the results of yield trials conducted under varying conditions of rainfall. Line selection is being carried out to improve the yields of the above varieties.

1318 Kawanishi, R.
(**Studies on sesame varieties. I**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 50–51. [Japanese].

Conspicuous differences between Japanese varieties in respect of maturation period, leaf size and shape, branching habit, number of capsules per node, number of locules per capsule, and grain colour are reported.

1319 Mazzani, B.
"Morada": nueva variedad de ajonjolí producida en el Instituto Nacional de Agricultura. (**Morada, a new variety of sesame produced at the National Institute of Agriculture**).
Agron. trop., Venezuela 1953 : **3** : 205–09.

The variety Morada [Brown] is a selection characterized by slender stem free from lodging, deciduous leaves and relative freedom from attack by aphids, *Cercospora sesami* and *Alternaria* sp. Its yield of seed of over 1229 kg. per ha. has exceeded that of other varieties grown in Venezuela.

1320 Mazzani, B.
"Inamar": nueva variedad de ajonjolí producida en el Instituto Nacional de Agricultura. (**Inamar, a new variety of sesame produced at the National Institute of Agriculture**).
Agron. trop., Venezuela 1953 : **3** : 211–13.

The variety described originated from a cross of Venezuela 51 x 45·1138; it is early, vigorous in growth, branches abundantly, ripens uniformly and is adapted to conditions of high

humidity. In yield of seed it has been beaten only by the variety Acarigua.

1321 Iljina, A. I.
[Causes of dehiscent "seed" in *Lallemantia iberica* var. *typica* (Ster.) F. et M.].
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1954 : **96** : 1253–56. [Russian].
At Krasnodar, dehiscence in *L. iberica* var. *typica* is associated with the anatomical structure of the pericarp. Material suitable for breeding indehiscent varieties is being studied.

1322 Blackman, G. E. & Bunting, E. S.
Studies in oil-seed crops. II. An assessment of the interrelationships between plant development and seed production in linseed (*Linum usitatissimum*).
J. agric. Sci. 1954 : **45** : 3–9.
The effects of nutrient level, plant density, spatial arrangement and variety upon seed production are analysed in terms of data on plant development collected from approximately 25 multifactorial experiments (cf. *PBA*, Vol. XXII, Abst. 1356).
The varieties tested were characterized by differences in seed weight, number of seeds per capsule, number of capsules per plant and the ability to produce more capsules at high levels of N fertilizer. The superiority of Royal in yielding capacity was attributable to its high rate of capsule production. Since the number of capsules per plant is greatly influenced by the density, it is suggested that the common practice of basing selection upon spaced plants may not give a true assessment of capsule formation at densities optimum for seed production.

1323 Deshpande, R. B. & Jeswani, L. M.
A note on the results of performance tests of N.P. rust resistant strains of linseed in the different states of India.
Indian J. Genet. 1954 : **14** : 22–38.
At each trial centre, superiority in yield compared with the best local variety has been shown by one or more of the rust-resistant strains. During the years of the tests, rust either did not occur or its incidence was negligible; under conditions of severe infection, the resistant strains are expected to show a more marked superiority. Possibly some of the strains are also resistant to *Fusarium* wilt. The rust-resistant strains were developed from crosses of NP types and hybrids with resistant introductions at the Indian Agricultural Research Institute, New Delhi.

1324 Wallace, R. H. & Schwarting, A. E.
A study of chlorophyll in a white mutant strain of *Helianthus annuus*.
Plant Physiol. 1954 : **29** : 431–36.
A single plant of Giant Russian, raised from a seedling whose plumule was subjected to ultrasonic vibrations, gave rise in the F_2 to a yellow mutant (cf. *PBA*, Vol. XVIII, Abst. 2026). This strain bred true until the F_5 generation, which contained a plant giving rise to pearly-white mutants. This white variation has been found to be devoid of carotenoids and to behave as a single monogenic recessive. The seedlings are vigorous and can be easily grafted, the scions being self fertile. Both as seedling and scion the white mutant shows normal phototropic and geotropic responses. Under suitable conditions the seedlings produce one-half to two-thirds as much protochlorophyll, chlorophyll a and chlorophyll b as green sib-seedlings under similar conditions.

1325 Ustinova, E. I.
(Influence of quantity and diversity of pollen on fertilization and embryo development in the sunflower).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1954 : No. 5 : 74–87. [Russian].
When the variety Saratov 169 was pollinated with large amounts of pollen from other plants of the same variety or from one or more other varieties, the pollen tubes penetrated the embryo sac 2–3 hours after pollination. With the same variety 1–2 pollen tubes penetrated and with other varieties 2–3 tubes often penetrated a single embryo sac; cases are described in which the nuclei from several pollen tubes enter the egg cell and occasionally even fuse with its nucleus. Fertilization occurred most quickly and embryo development was most vigorous when pure pollen of another variety was used; mixed pollen gave the next best results, followed by pure pollen of the same variety. When a limited quantity of pollen consisting of 5–10 grains was applied to the stigma the set was reduced considerably and no multiple fertilization was observed; the rate at which the process of fertilization took place was also reduced; the effectiveness of pollination with other varieties was reduced more than that from pollen of the same variety. The addition of a large quantity of dahlia pollen increased the set to almost normal in all cases, being even more effective in the treatment with pollen from the same variety than with foreign pollen. Dahlia pollen alone germinated on the sunflower stigma and penetrated the style but never reached the embryo sac.

The least effective mode of pollination of all was inbreeding, where fertilization was very slow or failed to be effected and the unfertilized egg cell sometimes remained unchanged for up to 15 days.
The development of the embryo after fertilization is described. In all cases various amitotic processes were observed in addition to mitotic divisions; they included budding of nuclei and nucleoli and fragmentation of nuclei and cells (sulcation). The seedlings obtained from pollinations with large quantities of pollen were more vigorous than those from limited quantities.

1326 Mjakuško, Ju. P.
(Promising intervarietal hybrids of sunflower).
Zemledelie (Agriculture) 1954 : No. 11 : 75–76. [Russian].

At Krasnodar, hybrids between varieties from the Institute of Oil Plants [VNIIMK] showed the same degree of resistance to *Orobanche* as the standards VNIIMK 1646, VNIIMK 8931 and VNIIMK 3497, and surpassed them in yield. The material was obtained by restricted open pollination or by multiparental hybridization. Direct and reciprocal crosses between VNIIMK 6570 and VNIIMK 3497 gave the highest yielding hybrids produced by the first named method and hybrids VNIIMK 8931 x (VNIIMK 3497 + Zelenka 368 [Green 368] + VNIIMK 8931) and Zelenka 368 x (VNIIMK 1646 + VNIIMK 8931 + Zelenka 368 + VNIIMK 6540) were outstanding among those produced by the second method.

1327 **First Annual Report of the West African Institute for Oil Palm Research, 1952-53** : Pp. 135.

The above institute is based upon the former Oil Palm Research Station of the Agricultural Department of Nigeria.
The following three groups of pollinations were effected in 1949. A range of selected *dura* and *tenera* palms was selfed and crossed in all possible combinations to obtain reliable foundation material for inheritance studies. Crosses of *dura* x *pisifera* were made for studying the effect of variations in the *dura* parents upon the progenies. Trees of the *pisifera* type were crossed with *dura* palms, to investigate the problem of selecting *pisifera* males for their inherent bunch-yielding capacity. Trials of progenies from all three groups of pollinations have been established.
New areas of selection are being exploited at Aba and Ufuma in Nigeria.
Investigations on the segregation of internal and external fruit characters continued.
For pollen storage over $CaCl_2$ the optimum relative humidity is probably approximately 50%. Viability was highest when the pollen was stored at temperatures near 0° C. Sufficient drying of the pollen before storage also promoted maintenance of viability. In investigating pollination technique, sterilization of the inflorescence with dilute solutions of formalin was found to have a harmful effect upon pollen viability.
Extensive data on leaf and flower production are being studied with a view to gaining information on the variation and inheritance of these characters and on their relation to yield.
Germinated seeds were treated with colchicine in an attempt to induce tetraploidy.

1328 Chandler, C.
Improvement of *Plantago* for mucilage production and growth in the United States.
Contr. Boyce Thompson Inst. 1954 : **17** : 495–505.

The floral biology of *P. ovata* ($n = 4$), *P. wrightiana* ($n = 10$) and *P. rhodosperma* ($n = 12$) was studied with a view to devising suitable techniques for pollination. Male-sterile plants were of frequent occurrence in *P. ovata*. Each species set seed abundantly when open pollinated. Interspecific crosses failed. By treating seeds with colchicine, tetraploidy was induced in all three species. The tetraploids were somewhat reduced in fertility but were superior to the diploids in seed size, mucilage yield and plant vigour; they are undergoing trial in commercial plantings in Arizona.

1329 Paardekooper, E. C.
Resultaten van twee onderstamproeven bij *Hevea*. **(Results of two stock trials with *Hevea*).**
Bergcultures 1954 : **23** : 551–56.

The question of the best rootstocks for use in Java is discussed. In trials conducted at Peweja in 1938–39, illegitimate seedlings of the clones Av163 and Tjir 1 gave the most satisfactory results; the results of stock-scion trials carried out at Parung Pandjang in 1943 are also reported.

1330 Manis, W. E.
Phytophthora leaf fall and dieback.
Plant Dis. Reptr. 1954 : Suppl. No. 225 : 49–52. (Mimeographed).

The incidence of *Ph. palmivora* upon rubber clones and seedlings of various origin in Costa

Rica is surveyed; the disease first became serious in 1950. Recommended clones showing a high degree of tolerance are listed. Some clones resistant to both leaf blight and *Phytophthora* have been identified.

1331 LANGFORD, M. H. & TOWNSEND, C. H. T. (JUN.).
Control of South American leaf blight of *Hevea* rubbertrees.
Plant Dis. Reptr. 1954 : Suppl. No. 225 : 42–48. (Mimeographed).

The article includes an account of (1) selection and breeding for blight resistance carried out in South America in cooperation with the US Department of Agriculture and (2) the physiological specialization of the causal pathogen (*Dothidella ulei*). Much of the breeding has been done at Belterra, Brazil, under the auspices of the Instituto Agronômico do Norte. High-yielding oriental rubbers have been crossed with blight-resistant indigenous clones but so far only a very small percentage of resistant F_1 selections appear to be promising as regards yield.

FRUITS AND NUTS

1332 KOBEL, F.
Jahresbericht 1952/1953 der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. (**Annual report for 1952-1953 of the Federal Experiment Station for Viticulture and Horticulture in Wädenswil**).
Landw. Jb. Schweiz. 1954 : **3** : 585–670.

Details are given of the selection of new varieties of beans and other vegetables in addition to the following:—

Apple. The progress of new varieties resulting from experimental crosses is reported. The question of suitable rootstocks was investigated and the keeping qualities of varieties were compared.

Strawberry. The new variety Wädenswil 5, which includes Hansa [Hanseatic], Osterfee [Easter Fairy], Sieger [Victor], Roter Elephant [Red Elephant] and Deutsch Ewern in its ancestry, is described. It gives high yields of firm, attractive, dark-red berries with a slightly tart flavour.

Grape. The results are given of improvements effected in Blauburgunder and other varieties by means of clonal selection. A hybrid obtained from Früher Burgunder [Early Burgundy] x Gamay de Bouze is described. It ripens early and gives a high yield of quality grapes with good juice properties. Several other new crosses between European varieties show promise.

Onion. The results of further experiments in breeding varieties with improved keeping qualities are given. A strain possessing reduced susceptibility to bolting under long-day conditions has been developed.

1333 **The fruit breeders and testers of the United States and Canada.**
Fruit Var. hort. Dig. 1954 : **9** : 2–9.

Part I comprises an alphabetical list of fruit breeders and testers in the USA and Canada; Part II is arranged according to fruit species and provides particulars of individuals breeding or testing each type of fruit.

1334 MORI, H.
[**Studies on the inheritance of the principal characters of deciduous fruit trees (peach, oriental pear and kaki)**].
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. 1953 : Ser. E : No. 2 : Pp. 68. [Japanese].

A large number of crosses involving Japanese, and in the case of the peach, occidental varieties too, were made to elucidate the genetics of the characters cited hereunder:—

Peach. White flesh is dominant to yellow. Yellow flesh is associated with a yellowish tinge to the veins of the leaf and with deep orange pigmentation of the inner surface of the calyx. Melting flesh is dominant to nonmelting and is determined by multiple factors. Freestone fruits are dominant to clingstone, but inheritance is affected by modifiers. Red coloration of the flesh next the stone is controlled by multiple factors. Hybrids usually ripen at a date intermediate between those of the parents. The determination of flower size and type, whether large *futsuzaki* [normal] blossoms or the smaller *shibezaki* [flowers with a conspicuous centre] blossoms, depends on multiple genes. Leaves with reniform foliar glands are dominant to eglandular leaves; hybrids between these two types have globose glands. The inheritance of number of buds per node on one-year-old branches appears to be complex. Crosses between spreading and upright trees are intermediate in habit.

Oriental pear. Skin colour is controlled by the interaction of the two allelomorphic gene pairs *Rr* and *Ii*. Coarse-textured and soft-textured flesh both tend to predominate in F_1 crosses. It is difficult to combine the superior quality flesh characteristic of Nijiseiki [Twentieth Century] with a russet skin. Offspring tend to be less juicy than their parents. A correlation exists between juiciness and

firmness of flesh. Sugar content is an inherited character; the varieties Kikusui and Meigetsu [Full Moon] readily transmit their high sugar content to their offspring. The aroma of Chojuro and Ori [Duck pear] is only transmitted to a few of the offspring. Hybrids usually but not invariably ripen at a time intermediate between the maturation dates of the parent varieties. Fruit shape is inherited in a complex fashion. The size of the fruit dots in hybrids is usually intermediate between the sizes in the parental varieties.

Kaki. Data are provided on the genetics of astringency and on the relations between degree of astringency and other fruit characters. The shape of fruit in hybrids tends to be intermediate between those of the parent varieties.

1335 Miller, E. V.
The natural origins of some popular varieties of fruit.
Econ. Bot. 1954 : **8** : 337–48.

In an expanded version of a previous article (cf. *PBA*, Vol. XXIV, Abst. 3260), the author gives an account of the origins of many commercial varieties of tree and bush fruits which are now cultivated in the USA and which are believed to have arisen as the result of natural hybridization or mutation.

1336 Barg, T.
Über zytologische Untersuchungen von Stammbildner- und Saatgutspendersorten des Kernobstes. (**On cytological investigations of varieties of pome fruit suitable as stem builders and for the production of seedlings**).
Gartenbauwiss. 1954 : **1** : 273–76.

Of 38 southern German varieties of apple and pear examined, the pear Oberösterreichische Weinbirne [Upper Austrian wine pear] and the apples Biburger Klosenapfel, Josef Musch, Schöner aus Aich [Beauty of Aich], Effeltrichter Findling, Jakob Fischer, Gravensteiner von Hügelhart [Hügelhart Gravenstein] and Frauenbirne [Ladies' pear] proved to be triploids. The triploid varieties were irregular in meiosis and, as their yield of fertile seeds was extremely low, they are considered useless for the production of seedlings.

The Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, Bristol, 1953 : Pp. 217.

1337 *Williams, R. R. A survey of perry pears in the West Midlands: I. North-west Gloucestershire.* (*pp. 64–69*).

Information is given on the names, synonymy and distribution of varieties in north-west Gloucestershire, England.

1338 *Williams, R. R. Perry pears and their characters: I.* (*pp. 70–78*).

Thirteen varieties are described and illustrated.

1339 *Burroughs, L. F. & May, Y. P. The composition of the juices of some varieties of cider apples.* (*pp. 178–83*).

Data are given on the average composition of the juices of 14 varieties. A statistical analysis of 308 samples of Kingston Black indicated that more than 50 samples of fruit are required to estimate the average specific gravity with a precision of $\pm$ 5 degrees. Analysis of seasonal variation in the juice composition of this variety suggested that specific gravity is directly related to amount of summer sunshine; possibly this relationship also holds for other varieties.

1340 *Crang, A. & Sturdy, M. A comparison of some varieties of fruit preserved by bottling and by freezing. Progress report IV.* (*pp. 199–205*).

The report summarizes the results of tasting tests on (1) 24 varieties of plums preserved by bottling and freezing and (2) 10 varieties of raspberries, judged in the fresh condition and after bottling and freezing (cf. *PBA*, Vol. XXIII, Abst. 1513 and Vol. XXIV, Abst. 569).

1341 Jaarverslag van de werkzaamheden verricht in het jaar 1952 op het centrale bemestingsproefveld voor de fruitteelt "De Lange Ossekampen", Wageningen. (**Annual report of the activities at the central manuring trial field for fruit cultivation "De lange Ossekampen", Wageningen during 1952**) : 1952 : Pp. 108.

Information on yield, time of flowering and harvesting, and reaction to different levels of nitrogen fertilizer is given for ten apple and eight pear varieties tested at the above locality.

1342 Siĭmano, A. M.
(**The people's breeding achievements in horticulture in the Estonian SSR**).
Scientific session on problems of biology and agriculture. Riga 22–26 October 1951. Akad. Nauk SSSR, Moskva 1953 : 259–67.

Apples distinguished by earliness or good keeping properties, pears tolerant of low temperatures and *Sphaerotheca*-resistant gooseberries are described, besides other varieties of fruit trees and soft fruits bred in recent years in Estonia.

1343 Bishop, C. J.
X-ray induced bud sports in apples.
Fruit Var. hort. Dig. 1954 : **9** : 25–28.

A brief account of results obtained since 1948 at the Kentville Experimental Station, Nova Scotia, by using portable X-ray equipment to induce somatic mutations in the varieties Yellow Bellflower, Cortland, Sandow and Golden Russet is given (cf. *PBA*, Vol. XXIV, Abst. 3275).

1344 Aubert, P.
Eclaircissage des fruits. (**Thinning fruit**).
Rev. hort. suisse 1954 : **27** : 347–51.

Differences in the reactions of a number of apple varieties to α-naphthylacetic acid are noted in this popular article on the effects of chemical spraying to modify biennial bearing (cf. *PBA*, Vol. XXIV, Absts. 3271 and 3272).

1345 Schmidt, M.
Mehrjährige Beobachtungen über den Blühbeginn von Apfelsorten. (**Observations over several years on the inception of flowering in apple varieties**).
Arch. Gartenb. 1954 : **2** : 355–84.

An approximately constant order of flowering, based on observations made from 1935 to 1941, was established for the 271 varieties comprising the apple collection at the Erwin Baur Institute, Müncheberg, Germany. Length of flowering period was also found to be a fairly constant varietal characteristic. Tabulated data on the initiation, conclusion and average length of blossoming period are presented for each variety (cf. *PBA*, Vol. XIX, Abst. 474). Time of flowering varied considerably from year to year, depending on prevailing climatic conditions. The importance of a knowledge of varietal differences in duration of flowering period is discussed with reference to problems of cross pollination and the breeding of varieties that blossom late enough to escape spring frosts or have a sufficiently prolonged flowering period to compensate for any damage caused.

1346 Coutaud, J.
Contribution à l'étude de la fécondation et de la fructification chez le pommier. (**Contribution to the study of fertilization and fruiting in the apple**).
Ann. Inst. nat. Rech. agron., Paris 1954 : Sér. B : **4** : 51–127.

This article on the mechanism of fertilization in the apple and the influence of external and internal factors upon it includes notes on experiments carried out at Rennes on the degree of self and cross incompatibility of eleven varieties recommended for cultivation in Britanny and observations on the morphological characters of crosses effected between a number of these varieties. The diploid varieties studied proved better pollinators than the triploids; no correlation could be established between flower size and chromosome number.

1347 Maurer, K. J.
Zur Beurteilung der Stamm- bzw. Gerüstbildner. (**On judging stem and frame builders**).
Züchter 1954 : **24** : 259–64.

In trials at Giesenheim, Rhineland, to compare the suitability of 12 apple varieties as frame builders, Antonovka, Hibernal, *Malus prunifolia* 'Sikora type I' and Fredrowka were judged to be the best for general use in a continental climate. No evidence in support of the view that Virginia Crab is graft-incompatible with the majority of Central European varieties could be obtained. In the opinion of the author, primary importance is to be attached to frost resistance, compatibility with cultivated varieties and with other stocks, and favourable effect on the productive capacity of the scion. Rapid growth and straight stems are merely a secondary consideration.

1348 Hartman, F. O. & Howlett, F. S.
Fruit setting of the Delicious apple as affected by cytological changes within the flowers and young fruits.
Res. Bull. Ohio agric. Exp. Sta. 1954 : No. 745 : Pp. 64.

Approximately 30% of the ovules examined showed immature or degenerating embryo sacs at anthesis; it is suggested that these irregularities in Delicious are under genetic control. The frequency of fertilization was considerably reduced when pollination was delayed 48 hours after anthesis; this reduction is attributed to the early loss of stigma receptivity. Fertilization was seldom observed in embryo sacs in less than 72 hours after pollination. Many ovules contained multiple embryo sacs, originating either from common or secondary megaspore mother-cells. Fruit drop was not due to embryo abortion but rather to an inadequate number of fertilized ovules and competition with other fruits in the cluster.

1349 Schmidt, M.
Weitere Mitteilungen über einen früher beschriebenen Fall gehäufter Chimärenbildung beim Apfel. (**Further communications on a previously described case of the formation of aggregated chimeras in the apple**).
Züchter 1954 : **24** : 305–06.

In 1949, 214 apples were gathered from a Kaiser

Wilhelm seedling that bore a large number of fruits with mericlinal chimeras (cf. *PBA*, Vol. XVII, Abst. 333). The greenish-yellow sector characterizing the aberrant fruits, which constituted 55·1% of the total, varied in size from a narrow vertical slit to an expanse covering almost the entire area of the apple; in the majority of fruits, the affected section constituted over half of the total area of the apple. In almost all cases the greenish-yellow sector was sharply differentiated from that part retaining the deep-red surface colour characteristic of the Kaiser Wilhelm variety, but in some fruits a gradual merging of the one colour into the other was observed. The change from deep red to greenish-yellow is attributed to the mutation of genes for anthocyanin formation from the dominant to the recessive state.

1350 Archer, E. & Gauthier, M.
Les mérites du "Feuilloue" variété locale de pommes de la Basse-Auvergne. (**The merits of Feuilloue, a local apple variety in the Basse-Auvergne**).
Bull. tech. Ing. Serv. agric. 1954 : No. 92 : 455–64.

A popular account of the origin, fruit characters, quality and yield of this famous cider variety is presented.

1351 Meurman, O.
Akklimoituminen eli ilmastoon luontuminen. (**Acclimatization or adaptation to climate**).
Maatalous 1954 : **47** : 149–52.

A general review of theories of acclimatization is given, including the views of Lysenko, with special reference to the acclimatization of apple varieties in Finland.

1352 Batrakov, M. A.
(**The apple variety Rozovyĭ Naliv**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : p. 78. [Russian].

A description is given of this frost-resistant variety, which arose by local selection in the Gorjkiĭ region; it is superior to Grušovka Moskovskaja [Moscow Pear-like] in earliness, keeping capacity, suitability for transport, flavour and resistance to scab.

1353 Berkut, O. D.
(**New apple varieties for the Saratov district**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : 57–58. [Russian].

Saratov 8/46 is a seedling from Antonovka x Vagnera Prizovoe [Wagner's Prize] and is winter hardy and drought resistant, giving a high yield of sweetish-acid fruits. Šafran Saratovskiĭ 14/45 [Saratov Saffron 14/45] is a seedling of Antonovka x Parmen Zimniĭ Zolotoĭ [Winter Golden Pearmain] and is characterized by winter hardiness, drought resistance and a high yield of large fruits of good dessert quality. Renet Volžskiĭ 9/9 [Volga Reinette 9/9], a seedling from Antonovka pollinated with mixed pollen from Parmen Zimniĭ Zolotoĭ, Beljfler Želtyĭ [Yellow Bellefleur] and London Pippin, is described as winter hardy, fairly drought resistant and capable of giving a high yield of large fruits of good dessert quality. Rumjanka [Blush] is a local selection possessed of drought resistance and good yield and flavour.

1354 Tarasenko, M. T.
(**New apple varieties**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : 53–56. [Russian].

Two new apples have been obtained from open pollination of the variety Pepin Šafrannyĭ [Saffron Pippin]; the first is Timirjazevka, which is vigorous, scab resistant and hardier than its parent; it ripens at the same time as Antonovka but keeps longer. The fruits are larger than those of the parent and are juicy and pleasant in flavour. The second variety, Puškinskoe, also exceeds the parent in hardiness and size of the fruits, which are juicy and agreeable in flavour.

Trofimovka is a seedling of Grimes Golden and is characterized by late flowering and ripening and sweet, aromatic fruits.

1355 Ślaski, J. & Katulska, C.
Zdolność transpiracji niektórych odmian jabłoni w okresie spoczynku jako wskaźnik ich odporności na przemarzanie. (**The transpiration capacity of some apple varieties during the resting period as an indicator of their resistance to winter killing**).
Roczn. Nauk rol. 1953 : **66** : Ser. A. : No. 2 : 99–106.

One-year-old branches of bearing trees of the varieties Belle de Boskoop, Antonovka, Malinowa Oberlandzka, Oliwka Inflancka and Cox's Orange were taken from three sites and kept indoors at 3°–5° C. After 12 days the branches were weighed to determine the loss of water, then weighed again after a further 24 days and finally dried at 105° C to determine the total water content.

For each of the three sites, the same sequence of varieties in respect of rate of loss of water was obtained. On the basis of this result, it is suggested that water content in the resting

period might be taken as a characteristic typical of the variety.

In all varieties the amount of transpiration was greater in the first 12-day period after cutting than in the subsequent 24-day period. In the first period no correlation was found between loss of water and sensitivity to winter-killing. In the second period the intensity of transpiration was directly proportional to the sensitivity of the varieties to low temperatures; it was lowest for the hardy varieties Oliwka Inflancka and Antonovka.

1356 McIntosh, D. L. & Mellor, F. C.
Crown rot of fruit trees in British Columbia. III. Resistance trials on apple seedlings obtained from controlled crosses.
Canad. J. agric. Sci. 1954 : **34** : 539–41.

Data from F_1 seedlings derived from crosses involving the varieties Antonovka and McIntosh, both resistant to crown rot (*Phytophthora cactorum*), and Winter St. Lawrence and Yellow Transparent, both susceptible, indicated that resistance was either partially or completely dominant and that reciprocal differences did not affect the crown-rot reaction of a given cross.

1357 Dayton, D. F., Shay, J. R. & Hough, F. L.
Apple breeding for scab resistance.
Fruit Var. hort. Dig. 1954 : **9** : 12–13.

A brief popular account is given of breeding for resistance to *Venturia inaequalis* at the University of Illinois, Urbana; at Purdue University, Lafayette, Ind.; and at Rutgers University, New Brunswick, NJ. Resistance, which is determined by a single pair of genes, has been successfully transferred from ornamental species of oriental origin to susceptible commercial varieties, the hybrids then being back-crossed to the commercial parent. Rome Beauty x *Malus floribunda* and Wolf River x *M. zumi* var. *calocarpa* are mentioned as being among the crosses made (cf. *PBA*, Vol. XXIV, Abst. 3282).

1358 Šidenko, I. H.
(New varieties and promising hybrids of pear).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : 47–50. [Russian].

A number of seedlings suitable for cultivation in the Ukraine are described.

Bergamot Mleevskiĭ [Mleev Bergamotte] is a seedling from Joséphine de Malines x Comtesse de Paris; it gives regular yields of fruits weighing 100–170 g. each, with very juicy, aromatic flesh of good quality.

Osennjaja Mleevskaja [Mleev Autumn] is a seedling of Marianne x Duchesse d'Angoulême and bears large fruits weighing up to 500 g., with sweet, tender flesh of good quality; they are very firmly attached to the tree.

Desertnaja Mleevskaja [Mleev Dessert] is a seedling of Aleksandrovka x Clapp's Favourite and bears large fruits which contain up to 10·45% sugar and ripen between the summer and the autumn pears.

Mleevskaja Rannjaja [Mleev Early], a seedling of Esperen x Gliva Ukrainskaja [Ukrainian Gliva], bears fruits with white, aromatic flesh, which ripen 7–10 days after picking; the tree is frost resistant and very regular in bearing.

Hybrids 1580 and 1426, from Aleksanodrovka x Doyenné du Comice, are recommended for their frost resistance and fruit quality, the latter hybrid having a sugar content of 11·18% in the fruits. Hybrid 1912, from Joannon's Favourite x Joséphine de Malines, is recommended for its juicy, aromatic fruits and winter hardiness.

1359 Lobanov, G. A.
(The best pear varieties for the central zone of the USSR).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : 51–53. [Russian].

Descriptions are given of a number of pears capable of withstanding the rigorous climate of the central zone of the Soviet Union, some being selections by local growers, some Mičurin varieties and others seedlings selected by contemporary Soviet breeders. The last group consists of Narjadnaja [Smart], a seedling from Russkaja Moldavka [Russian Moldavian], a high-yielding, hardy form; Kolhoznaja [Collective Farm], a seedling of Bere Pobeda [Victory Beurré], a hardy pear with good fruit quality; Osennjaja Jakovleva [Jakovlev's Autumn], a hybrid of Dočj Blankovoĭ [Blankova's Daughter] x Esperen's Bergamotte, a fairly hardy late pear of excellent quality; Kubarevidnaja [Top-shaped], a seedling of Bere Oktjabrja [October Beurré], combining hardiness and quality; and Osennjaja Uljjanihina [Uljjanihin's Autumn], a hybrid of Bere Zimnjaja Mičurina [Mičurin's Winter Beurré] x Lesnaja Krasavica [Forest Beauty], an early hardy form, with moderate yields of large, sweet fruits of good quality.

1360 Schmidt, M.
Beiträge zur Züchtungsforschung bei Pflaumen. I. Über die Selbstungsnachkommenschaft einer Form von *Prunus insititia* L. **(Contributions to research on the breeding of plums. I. On the progeny of a selfed form of *P. insititia* L.).**
Züchter 1954 : **24** : 157–61.

The progeny of a specimen of *P. insititia*

possessing a high degree of self fertility was examined at the German Academy of Agricultural Sciences, Berlin. No indication of depression due to inbreeding could be ascertained and the great majority of the F_1 proved even more self fertile than the parent tree. Considerable segregation in respect of growth habit, time of flowering and ripening of the fruit, morphological characters and quality of the fruit, size and shape of the stone, length of stalk and the strength of its attachment to the fruit were observed. The trees were highly resistant to frost and drought and moderate in their soil requirements. Their possible value as stocks for cultivated varieties and as breeding material in crosses with cultivated forms is discussed and the need for a revision of the systematics of *P. domestica* in the light of recent research is mentioned.

1361 Rémy, P.
(Contribution to the study of the pollen of stone fruits of the genus *Prunus*).
Ann. Inst. nat. Rech. agron., Paris 1953 : 351–88.

The results of morphological and physiological studies of the pollen of species and varieties belonging to the genus *Prunus*, conducted at the Research Station for Vines and Fruit Trees, Pont-de-la-Maye, France, are presented. Differences in percentage of normal-sized pollen grains, varying from 85 to 98%, were noted, but these differences were not sufficiently large to assist in varietal identification. The proportion of normal pollen in hybrid varieties varied from 0 to 80%, depending on the degree of affinity of the parent trees. A positive correlation of 0·862 was found to exist between pollen size and style length. No direct relationship between pollen size and chromosome number could be established. Factors influencing pollen viability and longevity are discussed briefly.

1362 Renard, G. K.
(Sand cherry in the Omsk province).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 10 : p. 71. [Russian].

Breeding work at Omsk has included the production of hardy hybrids between *Prunus besseyi* and the Karzinskaja plum and the selection of *P. besseyi* seedlings that produce fruit weighing 2·15–2·5 g.

1363 Charrière, J.
Prunes et pruneaux dont on parle . . . à table et au marché. (Plums and prunes discussed at table and in the market).
Rev. hort. suisse 1954 : **27** : 338–41.

Data on the origin and fruit quality of the more important varieties cultivated in Switzerland are presented.

1364 Mann, A. J. & Keane, F. W. L.
The Sam cherry.
Fruit Var. hort. Dig. 1953 : **8** : 43–44.

Sam, a new high-yielding black cherry developed by the Summerland Experimental Station, British Columbia, from an open-pollinated seedling of V–160140, is described in detail. The tree is large, displays vigorous growth and is moderately winter hardy. Its fruit is large, firm, resistant to cracking and suitable for canning.

1365 Brooks, R. M.
Cherry breeding at the California station.
Fruit Var. hort. Dig. 1954 : **9** : 30–31.

A brief account of breeding sweet cherries at the California Agricultural Experiment Station, Davis, is presented. The main objectives of the programme are the development of (1) early maturing varieties to replace Chapman, Burbank and Black Tartarian, all of which suffer from serious commercial defects and (2) white-fleshed varieties suitable for canning and preserving to replace Napoleon.

1366 Bagenal, N. B.
History and development of the cultivated fruits (Part IV).
Rev. Ass. Agric., Lond. 1954 : No. 25 : 4–12.

This brief popular survey of the cultivation of the cherry in Britain since the time of its presumed original introduction by the Romans includes information on the more popular varieties cultivated and on recent breeding work both in England and on the continent (cf. *PBA*, Vol. XXIV, Absts. 2379 and 3288 and Vol. XXV, Abst. 490).

1367 Oldén, E. J.
Giant pollen grains in fruit trees from colchicine treatment in vacuum.
Hereditas, Lund 1954 : **40** : 526–29. (Abst.).

Application of vacuum conditions for a few minutes at the beginning of the treatment of

flower buds with colchicine solution has led to induction of giant pollen grains in plums, sweet and sour cherries and apples in experiments at the Balsgård Fruit Breeding Institute, Fjälkestad, Sweden. The best results have been obtained by treatment at the stage of reduction division. No disturbances in the germination of the giant pollen grains have been observed. Triploid seedlings have been secured by fertilizing the 2*n* cherry Napoleon by giant pollen induced in the 2*n* variety Early Rivers. The possible value of this technique in breeding is briefly indicated.

1368 Darrow, G. M.
The Capulin cherry of Ecuador.
Fruit Var. hort. Dig. 1954 : **9** : 23–24.

Prunus serotina ssp. *capuli*, a tetraploid cherry from Ecuador bearing heavy yields of firm, fleshy fruits with a slightly bitter taste and of approximately the same size as small Montmorency sour cherries, is described. It has been introduced into California and may prove of interest in those areas of the southern USA where the sweet cherry cannot be grown.

1369 Dupaigne, P. & Boulay, H.
Étude pratique de l'évolution des pêches et abricots—Campagne 1953. (**Practical study on the evolution of the peach and the apricot—season 1953**).
Bull. tech. Ing. Serv. agric. 1954 : No. 92 : 441–53.

Preliminary data on the growth, yield and fruit quality of varieties undergoing trial at a number of centres in the French Pyrenees are presented.

1370 **The new Redglobe peach.**
Hort. News, NJ 1954 : **35** : 2816–17.

The new freestone variety Redglobe (Admiral Dewey x St. John) has been released by the Horticultural Crops Research Branch of the US Department of Agriculture, Beltsville, Md. It produces high yields of attractive, firm, yellow-fleshed fruits suitable for canning, is self fertile and ripens 15 days earlier than Elberta.

1371 **The Maygold peach for the deep south.**
Fruit Var. hort. Dig. 1953 : **8** : p. 45.

The new clingstone variety Maygold, developed at the Horticultural Field Laboratory, Fort Valley, Ga., from Sunhigh x Southland, is described. It ripens some three days earlier than Dixired, is self fertile, and produces high yields of attractive, firm-fleshed, yellow fruits with a light-red blush and a good flavour.

1372 Hendershott, C. H., Arrington, E. H. & Westbrook, C. J.
Peach variety tests.
Rep. Ser. Ark. agric. Exp. Sta. 1954 : No. 40 : Pp. 16.

A report is given on the performance of 29 varieties in trials carried out at two substations in Arkansas during the 1952 and 1953 seasons.

1373 Ključareva, M. V.
(**Some cytological data on fertilization processes in peaches**).
Agrobiologija (Agrobiology) 1954 : No. 4 : 102–08. [Russian].

It has been shown that the fertilization process comprises, besides the fusion of the sex cells, metabolic interaction between the pollen tubes and the style and between the pollen tube contents and the zygote and endosperm. In a fertilized ovum the nuclei may originate as a result of gemmation from the mother nucleus or *de novo*. Supplementary pollination with foreign pollen is regarded as a normal phenomenon in peaches rather than an exception.

1374 Oberle, G. D.
Frost hardiness in peaches at the shuck-split stage.
Fruit Var. hort. Dig. 1954 : **9** : 19–22.

Tabulated data on differences in susceptibility to frost damage, based upon observations made in 1953 at Blacksburg, Va., are presented for 82 varieties of peach and nectarine. It is thought that the large fruits produced by Elberta, Golden Jubilee, Sunhigh and Crawford may have been due to natural thinning brought about by the comparative susceptibility of these varieties to frost.

1375 Chapot, H.
Les agrumes au Liban. (**Citrus fruits in the Lebanon**).
Dir. Enseign. agric. Vulgar., Liban 1954 : Pp. 39.

This illustrated account of the citrus-fruit industry in the Lebanon includes brief descriptions of the principal varieties of oranges and tangerines grown in the area.

1376 Benemerito, A. N.
Some promising citrus fruits introduced from China into the Philippines.
Philipp. J. Agric. 1953 (1954) : **18** : 1–29.

A list is given of common and Chinese lemons, sweet oranges, mandarins and pomeloes introduced from China into the Philippines between 1930 and 1939, and promising varieties suited

to local conditions are described. Varietal nomenclature is discussed in detail.

1377 Perišić, M.
(A study of fig mosaic along the Montenegrin littoral).
God. poljoprivred Fak./Yearb. Fac. Agric., Beograd 1952 : No. 4 : 229–34. [Serbian].

Of the 66 fig varieties in a collection at Bar only Džonkula, Zarigradska [Istanbul], Bijela Sultanija [White Sultan], Zimnica [Winter], Bujaka Crna [Black Bujaka] and Crna Petrovača [Black Petrovača] showed no symptoms of mosaic.

1378 Spina, P.
Il gelso nero (*Morus nigra* L.) in Sicilia. Ricerche sperimentali sulla biologia fiorale. [**The black mulberry (*M. nigra* L.) in Sicily. Experimental researches on its floral biology**].
Riv. Ortoflorofruttic. ital. 1954 : **38** : 328–37.

Remarks on the origin of the species and its botanical characteristics are followed by descriptions of the male and female flowers and of the botanical varieties grown in Sicily. Experiments on bagging the floral branches showed *M. nigra* var. *dentata* 'Gelso di Spagna a frutto nero' [Black-fruited Spanish] to be self compatible.

1379 Lazo Rodríguez, F.
Anón sin semilla. (**A seedless custard-apple**).
Rev. Agric., Habana 1954 : **37** : No. 2 : 83–85.

A custard-apple which bears seedless fruits otherwise similar in quality to the seeded form has been found in a garden in Cuba and is described.

1380 Gonzalez, L. G. & Feliciano, P. A. (Jun.).
The blooming and fruiting habits of the Ponderosa chico.
Philipp. Agric. 1953 : **37** : 384–98.

The Ponderosa sapodilla was successfully hand-pollinated with local material and with the varieties Sawoe Manila and Tava; the local form gave the highest fruit set. Ponderosa pollen is poorly developed and unsatisfactory for either self or cross pollination. Artificial self pollination of the local form was superior to natural self pollination or open pollination. Insect pollinators of Ponderosa and the local form are *Hermetia* sp., *Oecaphylla smaragdina* and *Dolichoderus bituberculatus*.

1381 Gutiérrez Texidó, G. & Parrado Alvarez, J. L.
Zapote o níspero sin semilla. (**A seedless sapodilla**).
Rev. Agric., Habana 1954 : **37** : No. 2 : 81–82.

A tree of *Achras sapota* bearing seedless fruits has been found in eastern Cuba. It is very prolific and the fruits are of excellent quality.

1382 Matta, G. J. da
A alfarrobeira em Portugal. (**The carob in Portugal**).
Bol. Jta. nac. Frutas, Lisboa 1952 : **12** : 18–56.

Descriptions of the principal varieties grown in Algarve are included.

1383 Krotkevič, P. G.
(Natural hybrids of walnut in bearing).
Les. Hoz. (Forestry) 1954 : No. **11** : 66–68. [Russian].

Descriptions are given of some hardy and vigorous hybrids recently found in the Kiev and Sumy provinces. Some have been identified as crosses between *Juglans regia* on the one hand and *J. nigra, J. cinerea* or *J. manshurica* on the other.

1384 Groven, I.
Orienterende sortsforsøg med hassel. (**Orientation trials with hazel varieties**).
Tidsskr. Planteavl 1954 : **58** : 240–64.

Results of observations on *Corylus avellana* and 18 varieties of *C. maxima* made at Spangsbjerg and Hornum in Denmark during the period 1938–52 are presented in table form.

C. avellana and the varieties Lang tidlig Zeller [Long Early Zeller] and Halleske Kæmpe [Halle Giant] proved most hardy, while Atlas, generally the earliest to flower, Hvid Lambert [White Lambert], Rød Lambert [Red Lambert] and Trapezunterhassel [Trabzon hazel] were most susceptible to frost.

C. avellana, Lang tidlig Zeller and a form referred to as xx grew vigorously, Trapezunterhassel, Hvid Lambert and Rød Lambert rather poorly.

The highest average yield of 14·2 kg. hulled nuts per year was given by Lambert Filbert at Spangsbjerg. Other good yielders were Lang tidlig Zeller and variety x. Lambert Filbert also produced the largest nuts, with a hundred-nut weight of 347 g.; but the highest percentage of kernel was found in Cosford, with a kernel

percentage of 59·6% compared with an average of about 45% for all varieties.
It is noted that Lambert Filbert is highly susceptible to *Monilia fructigena* and Rød Lambert, Hvid Lambert and Nottingham Prolific to attack by *Balaninus nucum.*
Illustrated descriptions of the characters of all the varieties under consideration are given.

1385 Iyengar, K. G.
Groundnut breeding in Mysore. Review of progress.
Mysore agric. J. 1954 : **30** : 16–18.
The history of groundnut breeding in Mysore and the results of field trials carried out during 1944–53 are reviewed.
The spreading groundnuts TMV3 and HG7 are superior to TMV1, HG7 giving a lower yield than TMV3 but bearing larger pods. The early bunch groundnuts HG8 and HG9 give higher yields than Spanish, and among the late bunch groundnuts HG10 and HG11 are superior in yield to HG1. A table containing the following data on the above varieties is given: time taken to reach maturity, yield of pods per acre, shelling percentage, number of seeds per kg. and oil percentage.

1386 Mital, S. P. & Mehta, T. R.
Some studies on groundnuts (*Arachis hypogaea* Linn.).
Indian J. Genet. 1954 : **14** : 13–21.
The groundnut strains comprising the collection at the Government Research Farm, Kanpur, Uttar Pradesh, have been classified into two main groups: (1) spreading types with procumbent branches and (2) erect types. Group (2) is subdivided into (*a*) types with decumbent branches and (*b*) bushy types. Representatives of group 2*a* are characterized by light green foliage, large leaflets and early maturity, those of group 2*b* by dark green foliage, medium-sized leaflets and later maturity. As an aid in future breeding, kernels were graded into four categories based on individual weight. In spreading types, the length, breadth and length/breadth ratio of the leaflet was found to be positively correlated with seed size. In erect types of group 2*a*, seed size was negatively correlated with oil content; in spreading types the positive correlation between these two characters was not significant. In both spreading and erect strains, no correlation was detected between seed size and shelling percentage. The association of earliness with light green foliage and larger leaflets, characteristic of group 2*a*, should prove useful in selecting for early maturity.

1387 Galland, P. & Martin, G.
Culture mécanisée de l'arachide et sélection au Moyen Congo. (**Mechanical cultivation of the groundnut and selection in the Central Congo**).
Oléagineux 1954 : **9** : 759–65.
Trials conducted at Loudima, French Congo, indicated that 270A and 270M were the varieties most suitable for mechanical harvesting and shelling.

1388 Sauger, L. & Catherinet, M.
Nouvelles observations sur la rosette chlorotique de l'arachide et les lignées sélectionnées. (**New observations on the chlorotic rosette of the groundnut and selected lines**).
Bull. agron. Fr. d'out. mer 1953 : No. 11 : 204–16.
The resistance to chlorotic rosette of the eleven lines of Virginia Bunch selected at the Bambey Plant Breeding Station in 1952 (cf. *PBA*, Vol. XXIV, Abst. 3331) was confirmed in a series of trials conducted in 1953 at a number of other centres in Senegal, although slight differences in degree of resistance from one locality to another were observed. Lines 48–37 and 48–45 also proved highly resistant.

1389 Coutinho, L. de A.
Aglutinações cromáticas em células máes de pólen de "*Olea europaea* L." (**Chromatic stickiness in pollen mother cells of *O. europea* L.**).
Genet. iber. 1953 : **5** : 47–63.
Phenomena such as stickiness and pseudobridge formation between the nucleolus and one or more of the chromosomes were observed during diakinesis and are interpreted as resulting from a delay in the migration of material from the nucleolus into the cytoplasm; this in turn is probably conditioned by the hybrid nature of the species.

1390 Morettini, A. & Armellini, S.
Le varietà di olivo coltivate nella provincia di Ascoli Piceno. (**The varieties of olive grown in the province of Ascoli Piceno**).
Ann. Sper. agr. 1954 : **8** : 1727–65.
In continuance of this study (cf. *PBA*, Vol. XXIII, Abst. 645 and Vol. XXIV, Abst. 617), the morphological and biological characteristics of twelve oil producing varieties and three table varieties are described, with information on their productivity, environmental adaptation and disease resistance. Varieties best suited to various parts of Ascoli Piceno are suggested.

1391 Horovitz, S., Micheletti de Zerpa, D. & Arnal, H.
Frecuencias de equilibrio de las formas sexuales en poblaciones de *Carica papaya* L. (**Frequencies of equilibrium of sexual forms in populations of *C. papaya* L.**).
Agron. trop., Venezuela 1953 : **3** : 149–74.
Calculations are presented showing the proportions of genotypes at which equilibrium is reached in populations of various initial genotypic composition as regards the genes determining sex type in papaya. Commercial populations examined mostly contained pistillate and andromonecious plants in roughly equal proportions, together with occasional staminate plants. A wild type of papaya occurring in Venezuela on the other hand comprised only staminate and pistillate plants; it had smaller fruits and certain other features which distinguish it from the cultivated forms but it crossed readily with them and there is no reason for excluding it from *C. papaya*. Evidence of natural crossing between the wild and cultivated forms has also been observed.

California Avocado Society 1953-54 Yearbook : **38** : Pp. 211.

1392 *Rounds, M. B. Report of the Avocado Variety Committee June 6, 1953.* (*pp. 19–22*).
Varieties are recommended for commercial planting in different districts in California and descriptive notes are given on varieties considered suitable for experimental planting.

1393 *Rounds, M. B. Report of the Avocado Variety Committee 1954.* (*pp. 23–25*).
Further information on varietal performance is provided.

1394 *Avocado varieties registered in 1953.* (*pp. 27–28*).
The following varieties are described: Beavers, Bessie, Bondoso, Carter, Dewey, Peg, Ponteprino, Reed and Snyder.

1395 *Winslow, M. M. & Enderud, J. Avocado variety trials.* (*pp. 31–32*).
Trials carried out by the Department of Horticulture, University of California, are briefly surveyed.

1396 *Winslow, M. M. Avocados at Mentone.* (*p. 33*).
A progress report of a test planting of varieties at Mentone, near Redlands, southern California, is given. This locality is unusually far inland for avocado production.

1397 *Griswold, H. Report of the Foreign Exploration Committee June 6, 1953.* (*pp. 35–38*).
Collections made in Mexico during recent years are surveyed with reference to their possible value for improving the avocado in California. The wild avocados may prove useful in developing root-rot resistant and more uniform stocks. From the West Indian x Mexican hybrids in the Ciudad Victoria area of Mexico it may be possible to obtain autumn-maturing commercial varieties.

1398 *Schroeder, C. A. Continued search for avocado rootstock and breeding materials—1953.* (*pp. 39–43*).
An account is given of collections of suspected West Indian x Mexican hybrids obtained in the neighbourhood of Ciudad Victoria in Mexico during 1953. Specimens of a species of *Ocoteo* and of a small-fruited type of avocado which is possibly a primitive form of the Mexican horticultural race were collected in the Gomez Farias district.

1399 *Zentmyer, G. A. 1953 collections in central America and Mexico for resistance to avocado root rot.* (*pp. 45–48*).
Information is provided on the collections of avocado and other *Persea* spp. obtained in Guatemala, Honduras and Mexico as possible sources of resistance to *Phytophthora cinnamomi*; progress made in establishing the collections in California is also outlined.

1400 *Schroeder, C. A. Report of the Subtropical Fruit Varieties Committee June 6, 1953.* (*pp. 49–52*).
Comments are made on promising varieties and specimens of fruit and nut species observed during field tours in California.

1401 *Schroeder, C. A. Report of the Subtropical Fruit Varieties Committee 1954.* (*pp. 53–61*).
Descriptive notes are given on recently registered varieties of macadamia, sapote, carissa, carob and cherimoya.

1402 *Halma, F. F. Avocado rootstock experiments—a 10-year report.* (*pp. 79–86*).
The most valuable information so far obtained is that Guatemalan varieties are more susceptible to chlorosis, *Verticillium* wilt and *Dothiorella* canker than Mexican types.

1403 *Gillespie, H. L. Development and evaluation of clonal rootstocks in the avocado—phase two.* (*pp. 87–95*).
The development of standardized rootstocks is

discussed with reference to the possible occurrence of bud mutation and to other problems.

1404 *Lee, B. W. Resistance—is it the answer to root rot?* (*pp. 117–20*).

The view is expressed that the breeding work now in progress will ultimately lead to the development of avocado rootstocks resistant to *Ph. cinnamomi.*

1405 *Schroeder, C. A. Abnormal fruit types in the avocado.* (*pp. 121–24*).

The abnormal fruit types described include some sectorial chimeras.

1406 *Halma, F. F., Zentmyer, G. A. & Wilhelm, S. Susceptibility of avocado rootstocks to* Verticillium *wilt.* (*pp. 153–55*).

Rootstock and seedling tests have shown Mexican varieties to be less susceptible to *V. albo-atrum* than Guatemalan types.

1407 *Halma, F. F. & Zentmyer, G. A. Relative susceptibility of Guatemalan and Mexican avocado varieties to* Dothiorella *canker.* (*pp. 156–58*).

Guatemalan varieties have exhibited less susceptibility to *D. gregaria* than Mexican avocados in plantings in Santa Barbara County.

1408 *Schroeder, C. A. Some aspects of pollination in the avocado.* (*pp. 159–62*).

Some observations on pollen production, mode of pollination, germination, pollen-tube growth and embryo development are reported.

1409 *Zentmyer, G. A. & Schroeder, C. A. Tests of* Persea *species for resistance to* Phytophthora cinnamomi. (*pp. 163–64*).

Only *P. borbonia* and *P. skutchii* have displayed resistance.

1410 Ledin, R. B.
The Mysore black raspberry in Florida.
Fruit Var. hort. Dig. 1954 : **9** : 10–11.

The Mysore black raspberry, introduced into the USA from India in 1948, has proved to be adapted to the climatic conditions of Florida, where it is recommended for cultivation by the University of Florida Sub-Tropical Experiment Station, Homestead. The fruit is up to three quarters of an inch in diameter, is dark purple in colour and has a pleasant flavour. Crosses of the Mysore black raspberry with three varieties of red raspberry are being studied.

1411 Kuminov, E. P.
(**The best varieties of raspberry in Siberia**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : p. 79. [Russian].

Classification according to frost resistance showed the seedlings bred in Siberia to be the hardiest, with one or two exceptions. The varieties are also categorized according to yield, earliness, vitamin C content and size of fruit. Novostj Kuzjmina [Kuzjmin's Novelty] and Visluha are pronounced the most suitable for Siberian conditions.

1412 Christ, E. G.
New blackberry named Jerseyblack.
Fruit Var. hort. Dig. 1953 : **8** : p. 36.

The new variety Jerseyblack, originally New Jersey 16 (cf. *PBA*, Vol. XXIII, Abst. 1460), is described. The plant, which is vigorous, thorny, high-yielding and of the semitrailing type, produces good-quality berries of a uniform shape.

1413 Sidzeljnik, V. I.
(**Testing new varieties of black currant**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : p. 79. [Russian].

A number of new varieties produced by the Altaĭ Fruit Research Station when tested at Penza ripened 3–4 days sooner than Lija Plodorodnaja [Productive Lija] and displayed resistance to leaf rust and good fruit flavour; they have large berries and give good yields of fruit.

1414 van der Geijn, S. A. H. M.
Biedt Nederland mogelijkheden voor de teelt van blauwe bessen? (**Does the Netherlands offer possibilities for the cultivation of blueberries?**)
Fruitteelt 1954 : **44** : 843–45.

It is concluded that certain areas of the Netherlands are suitable for the cultivation of blueberries and recommendations as to the best American and German varieties available for introduction are made.

1415 Jardoux
Journées d'études en Angleterre sur la production des plants de fraisiers. (**Days in England studying strawberry production**).
Pomme d. Terre franç. 1954 : **17** : No. 182 : 3–6.

A brief account of strawberry cultivation in England is given, with particular reference to the multiplication and control of new varieties and to breeding work at East Malling.

1416 Caroli, G.
Senga-Sengana, en ny rikbärande jordgubbssort. (**Senga-Sengana, a new highly productive variety of strawberry**).
Weibulls Allehanda 1954 : 64–65.

The origin, characteristics and performance in

Swedish trials of this variety, already referred to in Abst. 526, are described.

1417 Filosofova, T. P.
(Effects of the parental form upon the characters of strawberry hybrids).
Agrobiologija (Agrobiology) 1954 : No. 4 : 67–70. [Russian].

Studies in Moscow of various direct and reciprocal crosses included the hybrids between the vigorous new variety Krasavica Zagorjja [Ultramontane Beauty] and the long established variety Koralka [Coral]. Most of the hybrids resulting from this cross resembled the former variety. Some hybrids of Koralka x Krasavica Zagorjja and of Koralka x Roščinskaja have been selected for high yield and fruit quality.

1418 Jordan, C.
Die Abhängigkeit der Erdbeererträge von Düngung und Umweltbedingungen als Grundlage für die Züchtung hochertragreicher Erdbeersorten. **(The dependence of strawberry yields on manuring and environmental conditions as a basis for the breeding of high-yielding strawberry varieties).**
Züchter 1954 : **24** : 295–300.

The technique of organizing strawberry trial fields is discussed in general terms and the difficulty of obtaining yield results that are not invalidated by chance environmental factors is emphasized. It is suggested that, owing to fluctuations in weather conditions, a new variety should be tested at a number of different centres over a period of at least five years before any conclusions concerning its yield performance are drawn. As yield is extremely sensitive to environmental fluctuations, the highest yield obtained in any one year at any centre should be taken as the theoretical optimum performance of which a given variety is capable. Trials of several German varieties revealed considerable differences in ability to utilize food present in the soil and the importance of this factor in breeding is stressed.

1419 Lapteva, E. A.
(Distant hybridization of soft fruits).
Priroda (Nature), Leningrad 1954 : No. 10 : 104–05. [Russian].

At Voronež, hybrids between cultivated and wild strawberries have been obtained by pollinating the strawberry Komsomol with mixed pollen of cultivated and wild strawberries. Descriptions of hybrids selected for their productivity, large fruits and fine flavour are given. Hybrids 255/2, 417/4 and 363/3 are distinguished by earliness and 46/1 and 55/2 have perfect flowers.

1420 Haskell, G. & Williams, H.
Biometrical variation in flowers of a polyploid series of strawberries.
J. Genet. 1954 : **52** : 620–30.

"Studies were made of sepal, petal and stamen numbers in a polyploid series of strawberry (*Fragaria*) species and varieties, and in the related species *Duchesnea indica*. Sepal and petal numbers hardly varied with ploidy group, whereas stamen numbers of octoploids and decaploids were considerably higher than in lower ploidy groups and in *Duchesnea* (a dodecaploid). The mean stamen numbers fall in multiples of five, with minor variations.
"In octoploid Royal Sovereign the number of floral parts decreases from primary to later flowers, but the ratio of numbers of different parts remains more or less constant.
"The sex of a flower seems to have little effect on number of stamens, the gene for femaleness principally reducing anther development.
"Progenies from crossing octoploids indicate a genetic basis for floral part number.
"Comparisons are made with stamen studies in other plants. Several evolutionary problems are discussed: it is suggested that the strain of *Fragaria chiloensis* at present cultivated in Ecuador is not identical with the ancestral strain of the cultivated strawberry."
[Authors' summary].

1421 Holfelder, E.
Überprüfung von Erdbeersorten auf ihre Konservierungseigenschaften (1949–1953). **(Examination of the preserving properties of strawberry varieties, 1949-53).**
Züchter 1954 : **24** : 257–58.

Of fifty varieties tested at the Bavarian State Horticultural Experiment Station, Weihenstephan, Senga 29 proved superior in size and shape and in colouring, taste and firmness of flesh after preserving.

1422 Köhler, D.
Zur Qualitätsauslese bei Erdbeeren. **(Selection for quality in strawberries).**
Züchter 1954 : **24** : 307–11.

A brief survey of work at the Max Planck Institute for Breeding Research, Hamburg-Volksdorf, in selecting clones and varieties with greater firmness of flesh, improved taste and more attractive colouring is given. Emphasis

is being placed upon breeding varieties suitable for freezing which do not lose a high proportion of their juice when defrozen. Examination of data obtained on factors influencing the taste of the strawberry suggested that high yield may be correlated with low sugar content.

1423 Darrow, G. M.
The Ambato strawberry of Ecuador.
Fruit Var. hort. Dig. 1953 : **8** : 53–54.

The Ambato strawberry, a selection of *Fragaria chiloensis* native to Chile and said to have been introduced into Peru and Ecuador in the sixteenth century, is described. It bears perfect flowers, produces high yields of firm, aromatic berries and appears to contain desirable genes for uniformity of fruit, adaptability to short photoperiods and resistance to red stele (cf. *PBA*, Vol. XXIV, Abst. 1446), virus diseases, drought and fasciation.

1424 Hill, R. G. (Jun.).
Red stele resistant strawberries for Ohio.
Fruit Var. hort. Dig. 1953 : **8** : 41–42.

Data on yield and fruit quality are presented for the red-stele resistant varieties Aberdeen, Fairland, Pathfinder, Redcrop (cf. *PBA*, Vol. XXII, Abst. 1435), Sparkle, Temple and Vermillion (cf. *PBA*, Vol. XXI, Abst. 637 and Vol. XXII, Abst. 1432). Of this group, Fairland proved the most productive in trials in 1952–53 at the Ohio Agricultural Experiment Station, Wooster.

1425 Thuesen, A.
Dyrkningsforsøg med kloner af jordbær 1948–53. (**Cultivation experiments with strawberry clones, 1948-53**).
Tidsskr. Planteavl 1954 : **58** : 169–76.

These experiments were carried out at the Virum, Blangstedgaard, Spangsbjerg and Hornum research stations in Denmark to compare eight clones of the variety J. A. Dybdahl, obtained from different growers, with the variety Ydun grown at the Spangsbjerg Station. The clones differed markedly in yield. J. A. Dybdahl from Spangsbjerg exceeded the other strains, while the variety Ydun gave almost twice as big a crop as the best of the eight clones. There is some evidence that certain strains may be resistant to eelworm.

1426 Simmonds, N. W.
Anthocyanins in bananas.
Ann. Bot., Lond. 1954 : **18** : 471–82.

The author gives a detailed account of his analysis of anthocyanins in *Musa* species (cf. *PBA*, Vol. XXIV, Abst. 2445).

1427 Collins, J. L. & Carter, W.
Wilt resistant mutations in the Cayenne variety of pineapple.
Phytopathology 1954 : **44** : 662–66.

In investigations at the Hawaii Pineapple Research Institute, three clones of the above variety were found to possess heritable resistance to wilt caused by mealy bugs (*Pseudococcus brevipes*). It is believed that this resistance arose as the result of somatic mutation.

1428 Bruni, B.
La vite in montagna. (**The vine in the mountains**).
G. Agric. Domen. 1954 : **64** : p. 268.

Some new and old varieties are recommended for mountainous areas because of their earliness and good quality.

1429 Manzo, P.
I migliori apporti della genetica viticola. (**The best contributions of vine genetics**).
Riv. Vitic. 1954 : **7** : 277–79.

Reference is made to Regina dei Vigneti [Queen of the Vineyards] and Pirovano's hybrid Italia, with indications of the best methods of growing them.

1430 Cosmo, I. & Polsinelli, M.
Orientamento per i futuri impianti viticoli nella zona collinare di Conegliano-Valdobbiadene in provincia di Treviso. (**Guide for future planting of vines in the hill zone of Conegliano-Valdobbiadene in the province of Treviso**).
Riv. Vitic. 1954 : **7** : 323–34.

An abbreviated version of the work referred to in Abst. 540 is presented.

1431 Kriszten, G.
A szőlő terméképződése és a metszés elmélete. (**The theory of productivity and pruning in respect of the vine**).
Agrártudomány 1952 : **4** : 132–35.

Research on varietal differences in the mode of development of the inflorescence at the Magarač and Uzbek institutes, USSR, and in the Crimea is summarized.

FORESTRY

1432 Johnsson, H.
Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under år 1953. (**Annual report on the work of the Association for Forest Tree Breeding during 1953**).
Årsberätt. För. Växtf. Skogstr. 1953 : 3–19.

Ekebo Station

Work on conifers includes research on the northern limits of the range of cultivation in Sweden of test plantations of Continent spruce of various provenance.

Trials of 30 clones of southern Swedish plus trees of pine have been laid out on the Bjärsgård estate in Skåne.

Studies were carried out on pine cones from 26 hybrid combinations derived from crosses between pines of Swedish provenance differing little in origin (cf. Abst. 1456). Subsequently 45 different crosses were made with young grafted pines to ascertain the effect of crossing between pines of diverse provenance differing markedly in origin, e.g. Swedish mother trees crossed with pines from different parts of Germany and Switzerland. Interspecific crosses were also made to complete the hybrid series started in 1952.

As part of a study of the proper technique in raising pure seed plantations of various tree species, research on pollen distribution in pines has been begun.

Other work in progress comprises surveys which have resulted in the discovery of plus trees of spruce and pine; and experiments on the possibility of breeding for root rot resistance in pines.

The progenies of birch, aspen, elm and alder planted out during the year consisted of artificial hybrids within and between species or between different chromosomal races.

Progenies raised from seed included both curly birch hybrids and families of straight-fibred *Betula verrucosa*.

In the aspen breeding programme, large-scale plantations raised from seed of hybrid families are planned. Another way of improving growth increment and other characteristics is being tried, namely selection of outstanding trees for vegetative multiplication and ultimate use in monoclone cultivation or in mixtures.

In addition to extensive hybridizations of ash, sixteen alder crosses between different species and chromosomal races were carried out.

Brunsberg Station

Hybridization work with aspen and pine included crosses of (*a*) *Populus tremula* with *P. tremuloides*, and (*b*) 7-year-old grafted pines with unspecified pollen parents, these crosses being carried out in connexion with the series of hybridizations at Ekebo between Swedish and central European *P. sylvestris* and also between *P. sylvestris* and closely related species.

A fine stand of spruce at Mangslidberget flowered copiously in 1953, so that three series of field crosses could be carried out: (1) between different trees within the stand; (2) with Continent spruces as the male parent; and (3) with the North American *Picea mariana* as the pollinator. The object is to compare the increment obtainable from hybridization between trees of different provenance, between different species and between trees of the same stand.

Sundmo Station

Research was concerned with grafting of plus trees of pine, field surveys of races and field selection of plus trees.

Greenhouse work included crossings between (*a*) aspens (*b*) pine species and (*c*) pines of northern and southern Swedish provenance.

The regional botanical survey in Jämtland was completed.

1433 Rao, H. S.
Genetics and forest tree improvement.
Indian For. 1951 : **77** : 635–47.

The author gives a general review of the subject. In conclusion, he emphasizes the desirability of inaugurating a programme of forest-tree breeding in India.

1434 Rao, H. S.
Chromosome numbers in forest plants.
Indian For. 1954 : **80** : 551–52.

The chromosome numbers of *Ageratum conyzoides* ($2n = 20$), *Bauhinia galpini* ($n = 18$), *Butea monosperma* ($n = 9$) and 22 species of various other genera represented in India are reported.

1435 Rao, H. S.
Vegetative propagation and forest tree improvement.
Indian For. 1953 : **79** : 176–83.

A general discussion of the significance of vegetative propagation in forest-tree improvement is followed by lists of species in India capable of being multiplied by various methods.

1436 Schrötter, F. W. von
Forstgenetik im Waldbau. (**Forest genetics in sylviculture**).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 69–83.

The selection of suitable genotypes for seed production and for breeding purposes is discussed, with special reference to the present procedure of choosing plus trees in Schleswig-Holstein. The establishment of an official body to select and grade valuable genotypes and to certify seed obtained from them is advocated and an extension of the present system of breeding nurseries urged.

1437 Stern, K.
Zur Entwicklung eines forstlichen Sortenversuchswesens. (**On the development of a system of variety tests in forestry**).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 91–98.

The need for more extensive and reliable trials of forest trees is stressed and the comparative merits of different systems at present in use are discussed. The basic principles of simple progeny tests, factorial experiments and replicated experiments are explained and experimental designs of possible value in forestry outlined, emphasis being placed on the importance of long-term observations.

1438 Bergman, F.
Om skogsträdens sjukdomsresistens och dess utnyttjande inom skogsträdsförädlingen. (**On disease resistance of forest trees and its utilization in forest tree breeding**).
Årsberätt. För. Växtf. Skogstr. 1953 : 70–98.

In this comprehensive review of the above subject with particular reference to Swedish forestry, the author explains and discusses the different types of resistance known in trees and its various modes of inheritance. Consideration is then given to the results obtained so far in breeding forest trees for resistance to fungous diseases and pests in Sweden and other countries. Technique is discussed from the standpoints of genetical methods and sylvicultural and nursery practice.
In conclusion, advances already made and possible prospects in this field of research are considered in separate sections on spruce, pine, larch, Douglas fir, birch, aspen and oak.

1439 (**The "Forestry" pavilion at the USSR Agricultural Exhibition**).
Les. Hoz. (Forestry) 1954 : No. 8 : 3–14. [Russian].
Žukov, A. B.
(**Science helps industry**).
Ibid. 1954 : No. 8 : 9–14. [Russian].
Jurre, N. A.
(**An outdoor section of the "Forestry" pavilion**).
Ibid. 1954 : No. 8 : 26–31. [Russian].

The exhibits on display at the Moscow exhibition included interspecific hybrids of basket willow giving high yields of good quality withes and new forms, obtained by vegetative or sexual hybridization, of drought-resistant oaks and aspens and of hardy poplars, walnuts and hazels.

1440 Globa-Mihaĭlenko, D. A.
(**Some characteristics of flowering and fruiting in *Quercus suber***).
Les. Hoz. (Forestry) 1953 : No. 8 : 16–20. [Russian].

At Krasnodar some forms bear acorns reaching maturity in a year, others in two years, while a third biotype is characterized by development of both these types of acorn. Cross fertility is described as low and some trees are said to develop hardly any acorns. Protandrous and protogynous forms and trees bearing only female or underdeveloped male flowers have been observed. In some seasons a tree with the one type of flower changed into the other. Pollen viability tests have been carried out. Good results were obtained when the pollen was kept at 0° C. It showed 40% viability after being so stored for three months. The pollen also remained viable for 10–12 days when it was kept at room temperature in a desiccator over $CaCl_2$. Reference is made to interspecific crosses between *Q. suber* and deciduous forms of oak that have given 30% success.

1441 Ljunger, Å.
Primärympning och plusträdsurval av ek. (**Primary grafting and plus trees of oak**).
Årsberätt. För. Växtf. Skogstr. 1953 : 52–69.

This is an extended form of the paper summarized in *PBA*, Vol. XXIV, Abst. 3373.

1442 Kuzjmin, A. V.
(**A giant aspen from the Šarjinskiĭ forest collective**).
Les. Hoz. (Forestry) 1954 : No. 12 : 48–53. [Russian].

A large-leaved form, found in the Kostroma

province, is described. It surpasses neighbouring trees of *Populus tremula* in resistance to *Fusicladium* and annual rate of growth.

1443 FLORDH, S.
Studier av några F_2-populationer av hybridasp. (**Studies of some F_2 populations of hybrid aspen**).
Svenska SkogsvFören. Tidskr. 1954 : **52** : 287–98.

Observations in 1953 at the Ekebo Station of the Swedish Association for Forest Tree Breeding showed that though the F_1 generation from *Populus tremuloides* x *P. tremula* was superior in many respects to the Swedish aspen (cf. *PBA*, Vol. XXIII, Abst. 2996), the three F_2 populations studied were inferior to the hybrid in growth, stem form, type of branching, resistance to diseases and pests, leaf size and length of stomatal openings.
The normal chromosome number ($2n = 38$), determined in 1949 for the three hybrid populations, and the fact that meiosis in the F_1 had shown no marked irregularities, and fertility was good, seem to indicate a close relationship between the parent species, which should possibly be regarded as having the status of geographical races.
In assessing the genetic and sylvicultural possibilities of the *P. tremuloides* x *P. tremula* cross, it is pointed out that since none of the trees used in the original cross at Ekebo were of particularly good quality, the choice of superior parents might possibly give a higher percentage of better quality F_2 plants.

1444 MCCOMB, A. L. & HANSEN, W. J.
A naturally occurring aspen-poplar hybrid.
J. For. 1954 : **52** : 528–29.

Two stands of natural hybrids between *Populus alba* and *P. grandidentata* found recently in Iowa are described. The hybrids combine the superior form and growth habit of the latter species with the rapid growth of the former.

1445 WETTSTEIN, W.
Kurze Information über die Zitterpappel ("Aspe"). (**Brief information on the aspen**).
Allg. Forstztg. 1954 : **65** : 263–64.

The economic value of the aspen, especially for manufacturing matches, is discussed and the possibility of breeding trees with a faster rate of growth mooted. Crosses between individuals of *Populus tremula* from different parts of Europe were carried out in Austria from 1936 to 1939, the best results being achieved from a cross between a tree of Brandenburg origin and a Viennese genotype. Interspecific crosses made in 1948 at Mariabrunn, near Vienna, between *P. tremula* on the one hand and *P. alba*, *P. tremuloides* and *P. grandidentata* on the other, indicated that the most pronounced heterotic effects were to be expected from the combination *P. alba* ♀ x *P. tremula* ♂.

1446 SAUER, E.
Beobachtungen an zwittrigen Pappeln. (**Observations on hermaphrodite poplars**).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 89–91.

Of 50 catkins taken at random from a hermaphrodite tree of *Populus tremula* near Stuttgart, Germany, and examined at the Württemberg Forestry Research Institute, 17 had androgynous flowers, these being found usually at the apex of the catkin. The morphology of the androgynous flowers, most of which were malformed, is discussed; it was found that ovule number showed an inverse relationship to anther number. The possible causes of androgyny in the poplar are mentioned briefly and it is concluded that the phenomenon arises as the result of genic lability, especially in hybrids, and may be influenced by the age of the tree. Two further cases of hermaphroditism in the poplar, one in *P. alba* and the other in *P. candicans*, both found near Darmstadt in the spring of 1954, are reported briefly.

1447 ŠČEPOTJEV, F. L.
(**New hybrid forms of aspen**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1954 : **97** : 161–64. [Russian].

Two drought-resistant hybrids, bred at Harjkov from *Populus tremula* x *P. bolleana*, are described. One of them is distinguished by vigorous growth.

1448 WATERMAN, A. M.
Septoria canker of poplars in the United States.
Circ. US Dep. Agric. 1954 : No. 947 : Pp. 24.

In their native area American poplar species are highly resistant to stem infection by *Septoria musiva*, which, in the eastern USA, causes a destructive canker on introduced species and on many hybrids of black, balsam and cottonwood parentage. With the possible exception of *Populus alba* and *P. canescens*, all American and some European and Asiatic species are susceptible to leaf infection by the same organism.

Susceptibility tests in the eastern USA showed that hybrid clones with the Volga poplar as male parent tended to be resistant, and clones with *P. maximowiczii* as female parent to be highly susceptible. Data for other hybrids are also given. Different clones of like parentage did not all show the same degree of resistance.

1449 Dillemann, G. & Poucques, M.-L. de
Le pollen du *Sorbus latifolia* Pers. et son origine hybride. (**The pollen of *S. latifolia* Pers. and its hybrid origin**).
Bull. Soc. bot. Fr. 1954 : **101** : 239–40.

From a morphological examination of the above pollen, which was found to contain a high percentage of abnormal grains, many of which were also empty, the writers conclude that the species is a hybrid with an unbalanced chromosome complement.

1450 Pilipenko, F. S.
(**New data on the development of species and forms of *Eucalyptus***).
Agrobiologija (Agrobiology) 1954 : No. 5 : 69–88. [Russian].

Kozo-Poljanskiĭ's statement that reports on interspecific conversions are unsubstantiated (cf. *PBA*, Vol. XXIV, Abst. 2629) is rejected in so far as it applies to *Eucalyptus* forms grown under the climatic and soil conditions of the Caucasus. Many new examples of interspecific conversions, for instance of *E. laevopinia* into *E. vitrea* and of *E. deanei* into *E. angophoroides*, which have been observed at Soči, Adler and Lazorevskaja, are described besides those referred to in *PBA*, Vol. XXI, Abst. 2170. Evidence against an explanation of these interspecific changes by hybridization is discussed.

1451 Mattos, H. P. de
Estudos da ocorrência dos *Eucaliptus* na Austrália. (**Studies on the occurrence of *Eucalyptus* in Australia**).
Arch. Serv. flor. Brasil 1953 : **7** : 71–149.

In a report of a study tour in Australia reference is made to work by Pryor on selecting eucalypts for ornamental purposes, and to a collection of hybrids being examined for resistance to *Lyctus* and other insects.

1452 Karapetjan, S. K.
(**A few more remarks on a case of conversion of hornbeam into hazel**).
Agrobiologija (Agrobiology) 1954 : No. 5 : 150–56. [Russian].

An article, rejected by the editor of the *Botaničiskiĭ Žurnal* and intended as a reply to Ruhkjan (cf. *PBA*, Vol. XXIV, Abst. 3386), is published. It is claimed that further observations on the hornbeam bearing a hazel branch confirmed the writer's original hypothesis of interspecific conversion.

1453 Zinnai [Jinnai], I. & Hukuhara, N.
[**Rooting capacity of cuttings of artificially-induced tetraploids of *Cryptomeria japonica***].
Nihon Ringaku Kai Shi (J. Jap. For. Soc.) 1954 : **36** : 232–33. [Japanese].

Colchicine-induced tetraploid clones had the same rooting percentage but rooted earlier than the corresponding diploids. The roots of the tetraploids were thicker and had fewer root hairs than those of the diploids.

1454 Langner, W.
Über die Ursachen einiger phänotypischer Besonderheiten bei Fichtenpfropflingen. (**On the causes of some phenotypical peculiarities in spruce grafts**).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 83–86.

The conclusions arrived at by Müller-Stoll concerning the discovery of some spruce grafts with dwarfed growth habit and abnormally large cones (cf. *PBA*, Vol. XIX, Abst. 1346) are refuted and evidence to prove that the grafts were derived from a parent tree already possessing these characters is put forward. It is shown that the abnormality is genetically determined; crosses between aberrant female and normal male trees resulted in an F_1 consisting exclusively of trees with a stunted habit which did not produce cones.

1455 Zobel, B. J.
Abnormal cone formation in pines.
Tex. J. Sci. 1952 : **4** : 517–20.

A specimen of *Pinus ponderosa* in which some dwarf shoots were replaced by ovulate cones is described. The tree, which is thirteen years old and was found at Berkeley, Calif., outside the normal range of the species, had produced similar cone formations for three to four consecutive years and it is considered that the abnormality may be genetically conditioned. The possible economic value of such mutations in the mass production of hybrid seed is discussed.

1456 Johnsson, H., Kiellander, C. L. & Stefansson, E.
Kottutveckling och fröbeskaffenhet hos ympträd av tall. (**Cone development and seed quality in grafted pines**).
Årsberätt. För. Växtf. Skogstr. 1953 : 20–35.

An abbreviated form of this paper has already appeared in *PBA*, Vol. XXIV, Abst. 3393.

1457 SCHMIDT, W.
Kiefernherkünfte und Einzelstammabsaaten auf der Versuchsfläche Kaltenbronn /Schwarzwald. (**Pine provenances and single-tree sowings in the Kaltenbronn Experimental Plot, Black Forest**).
Züchter 1954 : **24** : 167–74.

Extensive comparative tests of pines of different German provenance, planted at Kaltenbronn in 1935, were made in 1953, special attention being paid to tree shape, rate of growth, ability to resist heavy falls of snow, healing capacity, number of branches, straightness of stem and climatic adaptability. Considerable variations in trees obtained from the same district and of presumably the same genotype were observed and marked differences in the degree of gene instability between pines of different provenance noted. Two main forms appear to exist, the thin-branched pines from East Prussia and the thick-branched forms found in the west of Germany and in the Alps. It is postulated that these two types are derived from the recolonization of Central Europe by pines from the Seine basin and the Balkans, respectively, after the end of the last Ice Age. Thin-branched forms normally show a greater degree of resistance to damage by heavy snow falls than thick-branched forms; nevertheless, the fact that thick-branched types of Black Forest origin are more resistant to damage than trees of East Prussian provenance indicates that factors other than thickness of branch must be involved. Trees from the Black Forest and from East Prussia had the straightest stems, East Prussian forms growing faster except under conditions of excessive shade, when trees of Black Forest provenance displayed the greatest rate of growth.

1458 KIELLANDER, C. L.
Om kontinentgranen. Härdighet, rasförädling och fröförsörjning. (**The Continent spruce. Hardiness, race breeding and seed supply**).
Svensk PappTidn. 1953 : Nos. 23 and 24 : 1–34.

In this report from the Swedish Association for Forest Tree Breeding, evidence of the frost resistance of the Continent spruce (cf. *PBA*, Vol. XXIV, Abst. 670) and the Swedish spruce is reviewed and possible physiological causes underlying hardiness are suggested.

Swedish research on the Continent spruce includes: (1) progeny trials (*a*) to determine possible differences in rot resistance, (*b*) to compare stands from different localities in Sweden, and (*c*) to study the inheritance of different types of branching; (2) hybridization between Continent and Swedish spruce to ascertain whether heterosis affecting growth increment occurs in the F_1 generation; and (3) extensive trials of clones of diverse provenance to study qualitative characters by Syrach Larsen's method (cf. *PBA*, Vol. XIX, Abst. 2912).

In discussing the difficulty of deciding which trees are worth testing in progeny trials, mention is made of the association between coarse branching and large bole, the combination of fine type of branching and moderately large diameter being almost impossible to find. Fineness of branching may, however, be associated with a relatively higher average diameter for the stand than the coarse or intermediate type. Since the real origin of all the Continent spruce stands, so far under investigation by the association, is unknown, a tour was undertaken to the more important areas of distribution of the spruce in western Germany, Austria, Switzerland and France and to a few stands in Belgium, where the spruce does not grow wild. Trees were selected and registered in some 30 stands for subsequent progeny tests and for use in grafting. Progenies from whole stands will also be tested in Sweden.

Spruces from high altitudes on the continent, e.g. in the Tyrol, are characterized by their excellent timber, small crowns and elegant shape. Among the spruces from such high lying situations, the hazel spruce exhibits a characteristic structure as regards its timber. The same peculiarity is found occasionally in other conifers and seems to represent a parallel variation occurring in several species; it is purely an alpine phenomenon which has probably arisen by mutation and may be modifiable.

Reference is made to research on the induction of polyploidy in *Picea* (cf. *PBA*, Vol. XXI, Abst. 674) and the effects of colchicine treatment of spruce seed, as observed after the trees have reached 10–13 years of age. The discovery of a number of natural tetraploids of spruce is also recorded, with observations on the technique of chromosome number determination (cf. *PBA*, Vol. XX, Abst. 2070) and on the potential value of tetraploids for obtaining triploids by hybridization with the diploid form. Fortunately many of the tetraploids found have appeared in diploid material of the fast-growing Continent spruce.

The establishment of seed plantations of Continent spruce and their object are discussed and the use of grafted seedlings in interspecific crossing is described. The possibility of supplying

adequate seed of Continent spruce annually for Swedish forests is considered.

1459 MEYER, H.
Zur Blasenrost-Resistenzzüchtung mit *Pinus strobus*. (**On breeding for resistance to blister rust in *P. strobus***).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 101–04.

Experiments conducted since 1950 at the Institute of Forest-Tree Botany and Genetics of the Faculty of Forestry, Münden, Germany, are described. Twenty-nine clones possessing a high degree of resistance to *Cronartium ribicola* were selected on the basis of phenotypic resistance; it is stressed that a wide range of initial material must be selected as many apparently resistant individuals prove susceptible at a later stage. Interspecific crosses between *P. strobus* and the Asiatic species *P. griffithii* gave fully resistant hybrids possessing a vigorous growth habit.

1460 VITÉ, J. P.
Unterschiedliche Anfälligkeit von *Larix europaea, leptolepis* und deren Bastarden gegen den Lärchenblasenfuss (*Taeniothrips laricivorus* Krat.) als mögliche Ursache verschiedener Wipfelformen. (**Different susceptibility of *L. europaea, L. leptolepis* and their hybrids to *T. laricivorus* Krat., as a possible cause of various tree-top shapes**).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 86–87.

The spread of *T. laricivorus*, which was first discovered in Czechoslovakia in 1926, in Germany is discussed. By destroying the juvenile crown of young larch trees, which is replaced by lateral shoots, the pest causes various deformities in the crown of the mature tree. The Japanese larch, although attacked by *T. laricivorus*, is not damaged to the same extent as the European larch. Hybrids between the two species studied at the Institute of Forest Zoology of the University of Göttingen varied in susceptibility to the pest but their fast growing habit enabled them quickly to overcome any damage caused.

1461 HEITMÜLLER, H. -H.
Beobachtungen über individuelle Resistenz gegen *Gilletteella cooleyi* Gill. an Douglasie. (**Observations on individual resistance to *G. cooleyi* Gill. in the Douglas fir**).
Z. Forstgen. Forstpflanzenz. 1954 : **3** : 99–100.

Differences in degree of susceptibility to the above pest in a mixed stand of Douglas firs at the Forestry Institute, Escherode, Germany, are described. One tree, of the *caesia* type, possessed complete resistance, as did also its progeny obtained by vegetative propagation. It is concluded that, although no particular race or form of Douglas fir can be said to possess resistance to this pest, resistant individuals may occur from time to time.

VEGETABLES

1462 **Fourth Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick, 1953** (1954) : Pp. 46.

In the section on breeding, J. C. Haigh reports that a large number of varieties of summer cabbage-lettuce, red beet and spring cabbage were classified into different groups.

Bud-pollinated progenies of the Brussels sprout variety Cambridge Special are under investigation. The possibility of maintaining a good phenotype by vegetative propagation until its progeny has been tested is being explored. Self compatibility commonly occurs in this crop but usually only to such a small extent that the normal self-incompatibility system is unaffected. With a view to gaining further information on this system, inbreds developed by selection for self compatibility are to be compared with those produced by bud pollination. Through the cooperation of the John Innes Horticultural Institution, clonal material has been X-irradiated in the hope of inducing mutation in the self-incompatibility system.

The amount of natural crossing between the Brussels sprout varieties Cambridge Special and Cambridge Special 3 when interplanted, and the consequent expression of hybrid vigour, are being studied with a view to judging the merits of interplanting as a method of producing commercial stocks of hybrid seed.

The extent of natural hybridization between different varieties of *Brassica oleracea* is being determined.

1463 EVDOKIMOV, M. M.
(**New varieties of vegetables, cucurbits and potatoes**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : 26–30. [Russian].

Potato. Falenskiĭ is an early variety that can be lifted in the middle of July; it is resistant to wart and exceeds Early Rose in yield of tubers though not in quality.

Melon. Dočj Kolhoznicy [Collective Farmer's Daughter], produced at the Birjučiĭ Kut station

from a cross of Kolhoznica 647/649 x Zimovka 264, is distinguished by high yields of up to 201 c. per ha. of fruits, weighing 1·1–2·5 kg., of excellent flavour and transporting capacity; it is also drought resistant.

Cabbage. The variety Stepnaja Havskaja [Havskaja Steppe], a midearly cabbage produced by the Verhne-Havskaja station, has yielded 32–72 c. per ha. more heads than Braunschweig 423, which it excels in keeping properties and resistance to diseases, pests and drought.

Pumpkin. Birjučiĭ Kut 27 is an early variety which has yielded up to 403 c. of fruits per ha., the fruits weighing from 4 to 8 kg. each and keeping well. The plants are resistant to fungous and bacterial diseases.

Cucumber. Two varieties produced by the Institute of Plant Industry, Leningradskiĭ Tepličnyĭ [Leningrad Hothouse] and Dlinnoplodnyĭ [Long-fruited] have exceeded former varieties in yield both in the greenhouse and out of doors. The former is resistant to *Sclerotinia* and to red spider mite and produces fruits of good quality suitable for transport; the latter variety has large fruits weighing up to 500 g., which are produced readily even without pollination; it is also resistant to spider mite and not badly affected by *Sclerotinia*.

Tomato. Urožaĭnyĭ, produced by the Institute of Plant Industry, is a semistandard variety with determinate growth habit, bears fruit with a good flavour and higher sugar content than Bison 639, which it outyields by 46% in the southern part of the Leningrad Province and excels in earliness and disease resistance.

Other varieties produced by the Institute of Plant Industry are suitable for growing in the open; they include Uraljskiĭ Mnogoplodnyĭ [Ural Multifruited], which bears large numbers of small fruits of good flavour and higher contents of dry matter and vitamin C than Bison 639; it is more resistant to bacterial and other diseases. Gruntovyĭ Gribovskiĭ [Gribovo Outdoor], from the Gribovo station, also excels Bison 639 in yield, fruit flavour, content of dry matter, sugars and vitamin C, earliness and disease resistance.

1464 Ušakova, E. I.
(At the Gribovo Horticultural Breeding Research Station).
Priroda (Nature), Leningrad 1954 : No. 10 : 57–60. [Russian].

Notes on the economic properties of some varieties of carrot, radish, cabbage, tomato and peas, bred within the last three decades at Gribovo, include a reference to a new form of pea with a growth habit intermediate between determinate and marrowfat varieties.

1465 Lamm, R., Tometorp, G. & Åvall, H.
Klassificerande sort- och stamförsök med köksväxter 1951–1954. (**Classifying variety and strain trials with vegetables in 1951-54**).
Medd. Trädgårdsförs. Alnarp 1954 : No. 86 : Pp. 44.

Detailed results are recorded of the classifying trials carried out at the State Horticultural Station at Alnarp, Sweden, on varieties and strains of peas, beans, dill, radishes, spinach and various types of cabbage (cf. *PBA*, Vol. XXII, Abst. 1483).

1466 Philipp, F.
Das österreichische Zuchtbuch—Sektor Gemüsebau. (**The Austrian book of cultivated varieties—vegetable section**).
Mitt. Klosterneuburg 1954 : Ser. B : **4** : 187–230.

This account of regulations in force in Austria on the production of vegetable seed and the testing and registration of new varieties includes a brief description of immediate aims in breeding and a list of authorized varieties.

1467 Tastversuche mit amerikanischen Gemüsesorten. (**Preliminary trials of American vegetable varieties**).
Saatgutwirtschaft 1954 : **6** : p. 326.

American varieties of tomato, cabbage, carrot, cucumber, lettuce, hybrid onions, radish and beetroot thought suitable for cultivation under German conditions are listed and their main characteristics given. The cultivation of American varieties of bean and pea is not recommended as they are considered inferior to German varieties.

1468 Ito, S. & Yamamoto, M.
(Some cytophysiological studies of polyploid radish).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1953 : **22** : 81–82. [Japanese].

A comparative investigation of the physiological characteristics of the cell in diploid and artificially-induced polyploid radishes is reported. In general, differences between the two types were slight; one of the most conspicuous differences was the higher cellular dissociation revealed by staining with neutral red in the diploids as compared with the tetraploids.

1469 Boguslawski, E. v. & Waldeck, C.
Blütenbiologische Untersuchungen bei Ölrettich (*Raphanus sativus oleiferus* L.). [Investigations on the floral biology of the oil radish (*R. sativus oleiferus* L.)].
Z. Pflanzenz. 1954 : **33** : 133–50.

The length of vegetative development prior to flowering, the extent of cross and self pollination and the floral biology of the oil radish were investigated. The experiments, which were conducted at the Institute of Crop Cultivation and Plant Breeding of Giessen University, Germany, to obtain data of value in breeding work, showed that temperature had the greatest influence on vegetative and floral development. Self pollination was rare, wind pollination supplemented by pollination by insects leading to a satisfactory seed set provided the plants were growing fairly close together. Experiments on artificial pollination showed that the best results were obtained when the plants were emasculated between 08 and 10 hr. and fertilized immediately afterwards; ripe pollen germinated almost immediately and reached the egg cells within 6–8 hours. Considerably better results were obtained when flowers at an early stage of reproductive activity were employed than when older flowers were used.

1470 Angulo Carpio, M. D.
Aportaciones para el estudio de variaciones cromosómicas inducidas por ultrasonidos. III. Acción sobre meiosis de "*Allium cepa.*" **(Contributions towards the study of chromosome variations induced by ultrasonic waves. III. Action on meiosis in *A. cepa*).**
Genet. iber. 1953 : **5** : 23–46.

Misdivision, fragmentation, anaphase bridges and stickiness are among the effects of treatment described; one particular chromosome, possessing only a single chiasma, was more often affected by fragmentation than the others.
The effects were observed in treated inflorescences from normal bulbs and also in inflorescences arising from bulbs previously treated (cf. *PBA*, Vol. XXIII, Abst. 716). Certain c-mitotic effects were observed in somatic cells, leading to the production of some tetraploid cells.

1471 Tims, E. C.
Pink root of shallot, *Allium ascalonicum.*
Plant Dis. Reptr. 1953 : **37** : 533–37. (Mimeographed).

The article includes a brief account of breeding for resistance to pink root (*Pyrenochaeta terrestris*), carried out cooperatively by the US Department of Agriculture, Beltsville, and the Louisiana Agricultural Experiment Station. Among first-generation back crosses of amphidiploids of shallot x *Allium fistulosum* to shallot, 42% of the plants exhibited resistance but none were suitable for commercial use. Second back crosses, using resistant selections, have been made to the shallot.

1472 Olsson, G.
Crosses within the *campestris* group of the genus *Brassica.*
Hereditas, Lund 1954 : **40** : 398–418.

On the basis of data on the vigour and fertility of F_1 hybrids from crosses among 15 types all having a chromosome number of $2n = 20$, the author assigns *B. campestris* vars. *oleifera, toria* and *sarson, B. chinensis, B. pekinensis, B. narinosa* and *B. nipposinica* to *B. campestris* sens. lat., classifying the various forms into subspecies. These subspecies intercross readily to give fertile hybrids, except when yellow-seeded sarson, designated ssp. *trilocularis*, constitutes one of the parents. Since *B. tournefortii* cannot as a rule be crossed with *B. campestris* sens. lat. it is regarded as a separate species.

1473 Singh, U. P.
Preliminary studies in inducing seed set in cabbage in the plains of Uttar Pradesh.
Indian J. Hort. 1954 : **11** : 100–03.

In experiments at the Horticultural Research Station, Saharanpur, the variety Naples Early gave the highest set of seed. Promising results are being obtained from hybridization between this variety and Early Large Drumhead.

1474 Priestley, G.
Use of honey bees as pollinators in unheated glasshouses.
NZ J. Sci. Tech. 1954 : **36** : 232–36.

At the Crop Research Division, Lincoln, pollination of Savoy cabbage plants for stock-seed production was effected by the use of a strain of Italian honey bee in insect-proof glasshouse units. Each unit held about 40 plants and when flowering commenced two hives, each consisting of six frames, were introduced. As a result of the high temperatures reached during warm weather, bee mortality was high; seed setting was, however, satisfactory, 2·69 lb. clean seed being obtained from 80 plants.

1475 Svensson, V.
Välj rätt blomkålssort! (**Choose the right variety of cauliflower**).
Weibulls Allehanda 1954 : 34–38.
Brief descriptions are given of the varied selection of cauliflowers available at Weibullsholm to Swedish growers, the varieties being arranged in order of earliness.
The Weibullsholm breeding programme includes work on a Stor Svensk [Large Swedish] x Safir [Sapphire] cross from which it is hoped to obtain better spring cauliflowers than the existing forms. The improvement of the late Frankfurter types has also been taken in hand and the crosses Frankfurter x Safir and Frankfurter x Stor Svensk are expected to produce a good autumn cauliflower ultimately, and possibly also a hardy winter type.

1476 Singh, H. B. & Sikka, S. M.
The new cauliflower with a future.
Indian Fmg. 1954 : **4** : No. 7 : 16–18.
An early cauliflower variety has been developed by the Indian Agricultural Research Institute, New Delhi. It is said to head well, producing closely formed and uniformly emerging white curds of good quality.

1477 Axelsson, F.
Gaudry vinter W : s/52 Original. (**Gaudry Winter W : s/52 Original**).
Weibulls Allehanda 1954 : 59–63.
This light green spinach strain, intended for growing and overwintering in the greenhouse and also for overwintering in the open, was obtained by selection of early, fast-growing plants in the greenhouse from families derived from a cross of Gaudry and Anderssons vinterspenat (Andersson's winter spinach). Its erect habit and long-stemmed leaves may be of importance in machine harvesting. It grows rapidly and gives a high yield in the first pluckings. Its good performance in heated greenhouse trials at Alnarp (cf. *PBA*, Vol. XXIV, Abst. 2491) and in a cold greenhouse at Weibullsholm is described.

1478 **New Charleston Gray watermelon adapted to the southeast will be available for 1955 planting.**
Seed World 1954 : **75** : No. 5 : p. 44.
Charleston Gray, a long type developed by the Southeastern Vegetable Breeding Laboratory, Charleston, SC, is resistant to sunburn, *Fusarium* wilt and anthracnose and gives high yields of good-quality melons each weighing 28–35 lb. Its anthracnose resistance was derived from an African melon, its wilt resistance from the Australian variety Hawkesbury and its high quality mainly from Garrison.

1479 Grebenščikov, I.
Zur Vererbung der Dünnschaligkeit bei *Cucurbita pepo* L. (**On the inheritance of thin testa in *C. pepo* L.**).
Züchter 1954 : **24** : 162–66.
The literature on the inheritance of thin and thick testa in the pumpkin is subjected to a critical analysis and Schoeniger's view that thickness is determined by two factors, *H* and *N* (cf. *PBA*, Vol. XXI, Abst. 2221) rejected. Crosses between varieties with thin and thick testas, respectively, at the Institute for Research on Crop Plants, Gatersleben, Germany, have led to the conclusion that thin testa is monofactorially determined but that modifiers may exert a limited influence.

1480 Capinpin, J. M., Rodriguez, V. D. & Odejar, J. G.
Behavior of squash chimeras.
Philipp. Agric. 1953 : **37** : 258–72.
Marked similarities were observed between the variegation of the plants and fruits of two chimerical types and that of their sexual and asexual progenies; the chimeras were therefore probably the result of germinal mutation. Each type produced four distinct classes of variegated fruit which segregated according to a dihybrid ratio.

1481 Whitaker, T. W. & Carter, G. F.
Oceanic drift of gourds—experimental observations.
Amer. J. Bot. 1954 : **41** : 697–700.
Under conditions simulating oceanic drift, gourds of *Lagenaria siceraria* were found to be capable of floating for periods of up to 224 days without any significant decrease in seed viability. According to information on the current velocities, this length of time would be sufficient for gourds to drift from tropical Africa to the Brazilian coast. In tests of the seeds, immersion in sea water up to 95 days did not impair viability. These findings support the hypothesis of an Old World origin for this species, which is believed on archeological grounds to have been present in the Americas in pre-Columbian times.

1482 Camp, W. H.
A possible source for American pre-Columbian gourds.
Amer. J. Bot. 1954 : **41** : 700–01.
The author expresses the view that since *Lagenaria siceraria* is not a littoral type of plant the possibility of its introduction from Africa into South America by drifting across the Atlantic is remote (cf. Abst. 1481). Pointing out that this gourd has long been in use among the peoples of south-eastern Asia, he suggests

that the species was introduced into the New World by early migrants from Asia.

1483 Axelsson, F.
Weibulls Favör. Ny frilandsgurka. (**Weibull's Favör. A new outdoor cucumber**).
Weibulls Allehanda 1954 : 31–34.

The new variety, bred at the Weibullsholm Plant Breeding Institute from a 1940 cross between Rhensk druv [Rhine grape] and an unnamed early grape type, has been tested in various comparative trials since 1949. Favör [Boon], distinguished by its medium strong to strong growth, has cylindrical and uniform fruits which are of a fine green colour with finely granulated skin and a small seed cavity, which makes the variety especially suitable for pickling or salting. The fruits, which are not so large as those of Rhensk druv, display optimum proportions between length and thickness.

1484 Barnes, W. C. & Epps, W. M.
An unreported type of resistance to cucumber downy mildew.
Plant Dis. Reptr. 1954 : **38** : p. 620. (Mimeographed).

When inoculated with *Pseudoperonospora cubensis*, the cucumber introduction PI197087 produces very small brown lesions; the tissues within these lesions die much more rapidly than those of the larger yellow lesions usually produced on cucumbers. The brown-lesion type of resistance may be valuable in breeding.

1485 Immuna gurksorter. (**Immune cucumber varieties**).
Tidskr. Lantm., Helsinki 1954 : **36** : p. 157.

In this article, based on statements by A. Linnasalmi of the Plant Pathology Division of the Finnish Agricultural Research Institute and by Nyström of the Åland Cooperative Butchery, additional information is given on resistance to gummosis in varieties of cucumbers raised by Finnish growers (cf. Abst. 601). Superb OE48 and Kurga Muromsk showed good resistance; and Favör (cf. Abst. 1483) and Cavallius are also mentioned as resistant.

1486 Perlova, R. L.
(**Demonstration of the evolution of tomatoes and the cabbage**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1953 : No. **16** : 9–13. [Russian].

Reference is made to the wild ancestors of the tomato and to new varieties produced by Soviet breeders, including standard forms which do not require stakes or topping and give yields of up to 4 kg. of fruit per plant. The Gribovo station has also produced outdoor varieties which are hardy and do not require transplanting. A graft of the tomato Bison on *Cyphomandra* when crossed with the tomato Luščii iz Vseh [Best of All] gave rise to a tomato bearing fruits of very high sugar content.
A description is given of *Brassica sylvestris* and the various cultivated forms of the cabbage group thought to have evolved from it.

1487 Åkesson, H.
Immuna hävdar sig. (**Immuna holds its own**).
Weibulls Allehanda 1954 : 49–52.

The performance of this tomato in trials at the Agricultural College of Norway and at the Weibullsholm Plant Breeding Institute in Sweden has been notably good as regards yield, quality, earliness and resistance to leaf mould even under conditions of artificial infection at an early stage in a cold greenhouse. Immuna had the fewest ribbed fruits in the Norwegian trials. It is also a good indicator of magnesium deficiency.
The Weibullsholm trials also included two unnamed sister lines from a cross in which marked earliness and high total yield seems to have been successfully combined.

1488 Mackinney, G., Rick, C. M. & Jenkins, J. A.
Carotenoid differences in *Lycopersicon*: hybrids of an unusual race of *L. pimpinellifolium*.
Proc. nat. Acad. Sci. Wash. 1954 : **40** : 695–99.

The carotenoid pigmentation of the orange fruits borne by a race of *L. pimpinellifolium* from the Galapogos Islands consists almost entirely of β carotene, instead of all-trans lycopene, as in the red-fruited varieties. Data on the F_1 hybrids with *L. esculentum* 'Pearson' and on the F_2 and back cross to Pearson suggested that the orange-fruited race carries a gene with a major effect on carotenoid content and that this gene is closely linked with *sp* for the self-pruning character.

1489 Đokić, A.
(**Studying dominant characters in intervarietal tomato hybrids**).
Zborn. Rad. poljoprivred Fak./Rev. Res. Wk. Fac. Agric., Beograd 1954 : **2** : 88–104. [Serbian].

The F_1 and F_2 of direct and reciprocal crosses

involving *Lycopersicon esculentum* vars. *pyriforme* and *validum* and one yellow-fruited and two red-fruited forms of *L. esculentum* subsp. *commune* were analysed. Most of the hybrids matured earlier than their parents. Tall habit proved dominant over short and simple inflorescence over composite. Round fruit was dominant over pear-shaped and red over yellow. The exact mode of transmission of number of loculi and apiculate fruits was not established, but it was observed that fruits with many loculi usually occurred when the parental form had more than two loculi. A form characterized by earliness, tall habit and good formation of fruiting branches was noted. It transmitted these characters to its progeny more readily when it was used as ♂ than as ♀ parent. Hybrids between the red-fruited form of *L. esculentum* var. *pyriforme* and other varieties gave high yields.

1490 Robinson, R. W. & Rick, C. M.
New tomato seedling characters and their linkage relationships.
J. Hered. 1954 : **45** : 241–47.

Four new seedling mutants, each determined by a single recessive gene, are described: dwarf virescent (*dv*), reticulate virescent (*rv*), yellow virescent (*yv*) and trifoliate (*tf*). F_2 segregations showed deficiencies of homozygous recessives for *dv*, *rv* and *yv*; these deviations were probably due to the lower viability of the mutants. No linkage relationships were detected for *yv*. The other genes were found to be linked as follows: *dv* – 6 units – *m* – 1 unit – *d* on chromosome 2; *l* – 27 – *bu* – 9 – *dl* on chromosome 8; *rv* – 24 – *e*; and *tf* 13 units from a "wilty" gene not allelic with *wt*.

1491 Böhme, H.
Untersuchungen zum Problem der genetischen Bedeutung von Pfropfungen zwischen genotypisch verschiedenen Pflanzen.
(Investigations on the problem of the genetical significance of grafts between genotypically different plants).
Z. Pflanzenz. 1954 : **33** : 367-418.

Investigations by Russian research workers on vegetative hybridization are reviewed briefly and compared with experiments conducted at the Institute of Genetics of the Martin Luther University, Halle-Wittenberg, and at the Institute for Research on Crop Plants, Gatersleben. Six varieties of *Lycopersicon esculentum* and one strain of *L. pimpinellifolium* were grafted on each other in all possible combinations; in the majority of cases the fruit produced by the scion was more elongated than that of either stock or scion variety and changes in skin colour occurred. As, however, similar results were obtained by grafting the scion of one variety on to a stock from the same variety, this evidence is not regarded as conclusive, and it is thought that nutritional disturbances caused by the grafting process may lead to changes in fruit shape and to an increased frequency of somatic mutations affecting fruit colour. The only clear indication of vegetative hybridization occurring along the lines suggested by Russian research workers was found when Bonner Beste was grafted on to Goldene Königin [Golden Queen]. Of the 40 seeds obtained from the fruit of the scion, only one germinated, thus indicating disturbances in the reproductive process. The plant obtained from this seed bore fruit that in shape and number of locules resembled plants obtained by sexual hybridization between the two varieties.

1492 Zonjić, I. & Dumanović, J.
(A study of the F_1 and F_2 generations of vegetative hybrids).
Zborn. Radova poljoprivred Fak./Rev. Res. Wk. Fac. Agric., Beograd 1953 : **1** : No. 2 : 67–88. [Serbian].

At Zemun, heterosis was observed in the F_1 of tomato grafted on *Solanum racemigerum*. Changes that occurred in the leaf and fruit characters of a few F_1 and F_2 plants are described. A vegetative hybrid of maize, obtained by transplanting a flint embryo on to a dent endosperm, gave segregates in respect of kernel characters in the F_1.

1493 Brabec, F.
Untersuchungen über die Natur der Winklerschen Burdonen auf Grund neuen experimentellen Materials. **(Investigations on the nature of Winkler's burdos on the basis of new experimental material).**
Planta 1954 : **44** : 562–606.

A periclinal chimera, similar in most morphological and anatomical respects to Winkler's burdos (cf. *PBA*, Vol. XIII, Abst. 1110), was obtained at the State Institute of General Botany, Hamburg, from a graft between *Solanum nigrum* and *Lycopersicon pimpinellifolium*. Designated chimera 51, it arose as a shoot from the area immediately adjacent to the grafting junction and has remained constant in character for the two years of its existence. Its flowers and fruits resemble those of the tomato and, like Winkler's burdos, it is sterile.

Cytogenetic studies of the roots gave chromosome counts varying between 42 and 85. Meiosis was irregular, a large number of univalents being observed in metaphase I.

1494 Rick, C. M. & Barton, D. W.
Cytological and genetical identification of the primary trisomics of the tomato.
Genetics 1954 : **39** : 640–66.

Primary trisomics obtained from spontaneous triploids of *Lycopersicon esculentum* 'San Marzano' were classified into 12 types on the basis of their physiological and morphological characters. Eleven of the 12 types were identified cytologically as trisomics for different chromosomes; the remaining type could not be identified cytologically since the preparations were not sufficiently clear but it probably constitutes the twelfth primary trisomic. The longer the chromosome length at pachytene, the greater the degree of trivalent pairing at diakinesis. The frequency of each trisomic in the progenies of triploids corresponded fairly well with the rate of its transmission in progenies from $2n + 1$ plants selfed and from the combination $(2n + 1)$ x $2n$. The following relations were detected among chromosomes, genes and linkage groups. Chromosome 1 – *y* (linkage group III); 2 – *d* (I); 7 – *wt* (X) and *mc* (XII); 8 – *l* (VI) and *dl*, *al* (VIII); 9 – *wd*; 10 – *H* (VII). Little or no relationship was found between the phenotypes of the trisomics and those associated with the qualitative genes known to be situated on the respective extra chromosomes. The low level of chromosomal unbalance tolerated by the tomato, together with other lines of evidence, suggests that the species is a basic diploid with little or no duplication within its genome.

1495 Mertens, T. R. & Burdick, A. B.
The morphology, anatomy, and genetics of a stem fasciation in *Lycopersicon esculentum*.
Amer. J. Bot. 1954 : **41** : 726–32.

The rosette type of fasciation in *L. esculentum* is the result of the interaction of the recessive genes *f* for fruit fasciation, *lf*(*j*) for leafy inflorescence and *bi* for bifurcate inflorescence. Linkage between *j* for the "leafy-jointless" condition and *lf* was apparently complete; probably therefore only three loci were involved. The data suggested that *bi* is situated in linkage group V, in the order *bi–f–lf*. In the absence of *f* and *lf*(*j*), *bi* gives rise to a bifurcate inflorescence phenotypically distinguishable from that conditioned by *s*.

1496 Aĭzenštat, Ja. S.
(The effects of supplementary pollination with foreign pollen upon the vitality of stale pollen).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1954 : **97** : 907–10. [Russian].

When pollinated with pollen several days old, tomatoes and peas set more fruit if the stale pollen had been previously mixed with fresh pollen from other species. In experiments with tomatoes, pollen from pepper, egg plant, *Physalis* and wild potato was used. In the case of peas, the mixture consisted of lupin + vetch pollen. Data on the improved fruit set obtained are presented and the results of more detailed observations on peas analysed. It was found that foreign pollen had a beneficial effect upon the percentage sets of all pea varieties when the pea pollen used was 3–4 or 6–7 days old. It was, however, less efficacious when used with pollen that had been kept for 9–10 days. Intervarietal hybrids obtained by employing pollen 9–10 days old, e.g. Olivkovyĭ [Olive] x Neistoščimyĭ [Inexhaustible] or its reciprocal, resembled their maternal parent, the male characteristics being suppressed. The addition of foreign pollen to the stale pollen restored the ability of the male parent to transmit its characters to its progeny.

1497 Aĭzenštat, Ja. S.
(Influence of the duration of storage of pollen on the formation of the hereditary constitution of the progeny).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1954 : No. 4 : 42–58. [Russian].

Tomatoes possessing various recessive characters such as yellow fruits, standard growth habit and large number of locules per fruit were pollinated with varieties carrying the corresponding dominants, using fresh pollen and also pollen that had been stored for 3–4, 6–7 and 9–10 days in unsealed glass containers in the laboratory. The set fell sharply with increasing age of pollen and the germinating capacity of the seed was often reduced too. All the F_1 plants of the cross Zolotaja Koroleva [Golden Queen] x red *Lycopersicon cerasiforme* from fresh pollen bore red fruits like the pollen parent; on the other hand in some of those from stored pollen the fruits were yellow and those from pollen stored for 6–7 and 9–10 days bore exclusively yellow fruits. Similar results were observed in the cross Mičurinskiĭ Želtyĭ [Mičurin Yellow] x Bison. In other characters the F_1 plants were intermediate or resembled the

pollen parent, showing that they had not arisen from self pollination. In the F_2 of Zolotaja Koroleva x red *L. cerasiforme* using fresh pollen there were 10·6% of plants with yellow fruits, whereas 3–4 day old pollen gave 16·3%, 6–7 day old 80% and 9–10 day 100% with yellow fruits.

No difference between the results from fresh and stored pollen was observed in crosses of Čudo Rynka [Market Wonder] x yellow *L. cerasiforme*. In a cross of Goljden [Golden] x Budennovka all 13 F_1 plants from fresh pollen had red fruits like the pollen parent, whereas all 14 from 6–7 day old pollen had yellow fruits of intermediate shape.

In peas the pollen retained its viability longer and better sets of seed were obtained in some cases with pollen stored up to 7 days than with fresh pollen, the plants produced having larger pods and seeds. In the cross Rannii Zelenyi [Early Green] x Neistoščimyi [Inexhaustible] fresh pollen gave all yellow and greenish-yellow seeds like the pollen parent, 3–4 day pollen gave greenish-yellow with some green, 6–7 day pollen gave seeds of intermediate colour and 9–10 day pollen all green seeds like the seed parent. Pollination of the wrinkled variety Pioner Anglii [English Pioneer] x Olivkovyi [Olive] with fresh pollen gave all smooth seeds like Olivkovyi, 3–4 day pollen gave mostly smooth and 9–10 day pollen all wrinkled. Neistoščimyi, with wrinkled seeds, when pollinated with Rannii Zelenyi gave smooth seeds with fresh and 3–4 day old pollen, but wrinkled with 6–7 and 9–10 day old. In Zelenozernyi [Green Seeded] x the yellow-seeded variety Acacia, fresh and 3–4 day pollen produced green seeds, 6–7 day mostly green and 9–10 day pale green. Lincoln, with wrinkled seeds, x Syria, with smooth, gave slightly wrinkled seeds with fresh and 3–4 pollen, rather wrinkled with 6–7 day and fully wrinkled with 9–10 day pollen. The F_1 plants arising from the crossed seeds resembled the pollen parent in height, form of leaf, presence of anthocyanin in the axils, colour of flowers and small pods, except in the progeny from 9–10 day pollen, where the characters of the seed parent were predominant. Similar deviations were observed in many of the other crosses. The expected 3 : 1 ratios for yellow : green and for smooth : wrinkled were observed in the seeds borne by the F_1 plants from normal pollen whereas those from 6–7 day pollen gave ratios of 1 smooth : 7·2 wrinkled and 26·1 yellow : 1 green in the cross Neistoščimyi (with yellow wrinkled) x Rannii Zelenyi (green smooth), the deviations being thus again in the direction of the seed parent. In the F_1 of Pioner Anglii x Olivkovyi, using 9–10 day pollen, all seeds were wrinkled like the seed parent and there was a marked excess of yellow seeds.

Similar deviations in the direction of the seed parent were observed in the F_2 generations of families arising from stored pollen; in some cases one character deviated completely towards the seed parent while another character in the same cross segregated normally.

1498 Cybin, N. V.
(A new tomato variety).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1954 : No. 11 : 31–32. [Russian].

Puškinskii Bizon [Puškino Bison], produced from a hybrid of Bison x Earliana by back-crossing with Budennovka, has short stems that do not require tying, ripens fruit in the Moscow region at the end of July or beginning of August and yields 6–8 kg. of fruit per plant. It does not suffer from spring frosts and requires little watering.

1499 Becker-Dillingen, J. & Barg, T.
Arbeiten zur Gewinnung frostresistenter Tomatenformen. (**Studies on the production of frost-resistant tomato forms**).
Züchter 1954 : **24** : 252–56.

Experiments at the Horticultural Research Station, Weihenstephan, Bavaria, to select lines resistant to frost and capable of maturing 14 days earlier than present outdoor commercial varieties are described. Of several thousand plants exposed to 1–3° C of frost for three days in May 1952, 7 plants of the variety Rheinlands Ruhm [Rhineland Glory] and 35 bush plants were unaffected. When the progeny of these plants were tested for resistance in the open and in refrigerators in April and May 1953, a considerable number withstood temperatures of up to −4° C. A refrigerator technique developed at Weihenstephan to test horticultural plants for cold resistance is described in detail and a synopsis of the literature on the physiological basis of frost resistance in tomatoes is presented.

1500 Maklakova, G. F.
(Determining the resistance of Solanaceae to *Phytophthora*).
Zemledelie (Agriculture) 1954 : No. 9 : 111–13. [Russian].

Material that has shown a high degree of resistance in tests conducted at the Institute of Plant Industry includes some unspecified potato

hybrids and the tomato varieties Smorodinovidnyĭ [Currant], Gruntovyĭ Alpatjeva [Outdoor Alpatjev], Vynoslivyĭ [Enduring] and Majak [Lighthouse]. The wild species *Lycopersicon hirsutum* proved immune to the most virulent strains of *Phytophthora* and is regarded as promising breeding material. Light infection of *L. peruvianum*, which was previously considered to be immune, occurred during a severe outbreak of the disease in 1949.

1501 Hanna, G. C.
Breeding canning tomatoes.
Calif. Agric. 1954 : **8** : No. 11 : 12–13.

In breeding at the University of California, Davis, Pearson was crossed in 1944 with *Fusarium*-wilt resistant derivatives of Santa Clara-Red Currant, which has high contents of soluble solids and ascorbic acid. By back crossing repeatedly to Pearson, selections superior in yield and quality to this recurrent parent were obtained. They had, however, two drawbacks, viz. adhering stems and very soft fruit. Further selection has minimized the first disadvantage but soft fruit remains a problem. *Verticillium*-wilt resistance has now been incorporated in a number of the *Fusarium*-wilt resistant lines. In 1953 some selections were crossed with the firm-fruited variety Webb Special in an attempt to eliminate the undesirable character of soft fruit. Breeding is also being carried out to develop a San Marzano type suitable for mechanical harvesting. Promising selections have been obtained from crosses of this variety with Gem, a type with small determinate plants; *Verticillium*-wilt resistance has been incorporated in several of these lines.

1502 Holmes, F. O.
Inheritance of resistance to infection by tobacco-mosaic virus in tomato.
Phytopathology 1954 : **44** : 640–42.

Lines of complex hybrid origin, escaping infection with tobacco mosaic when exposed to inoculations just sufficient to infect nearly all plants of ordinary tomato varieties, were found to contain a single dominant gene for this level of resistance. The lines involved *Lycopersicon chilense* and other wild species in their parentage. No lines homozygous for this gene for resistance have yet been obtained.

1503 Fyfe, J. L.
Plant-breeding studies in leguminous forage crops. II. Further observations on natural cross-breeding in winter beans.
J. agric. Sci. 1954 : **45** : 141–47.

Using Fisher's method of maximum-likelihood scoring, as in the previously reported investigations (cf. *PBA*, Vol. XXII, Abst. 3064), estimates of $\hat{p}$ and α were obtained for farm crops of winter beans grown in 1950 and 1951, $\hat{p}$ being the frequency of a dominant allele, in this case for black hilum, $(1-\alpha)$ the proportion of successful fertilizations in which the pollen is derived from the same plant as the ovule, and α the proportion in which the source of pollen may be any plant in the crop. For the 1950 crop the estimates were $\hat{p} = 0{\cdot}467 \pm 0{\cdot}035$, $\hat{\alpha} = 0{\cdot}261 \pm 0{\cdot}034$; for the 1951 crops $\hat{p} = 0{\cdot}633 \pm 0{\cdot}026$ and $\hat{\alpha} = 0{\cdot}362 \pm 0{\cdot}023$. The differences in the estimates of $\hat{p}$ are attributed to the fact that the two crops were raised from different stocks; disparities in the values for α were possibly due to the greater density of the 1951 crop.

Selection of high-yielding parents produced a frequency distribution of genotypes showing no influence of inbreeding, confirming the conclusion previously reached that such parents are very probably all cross-breds. The data from the 1951 crops failed to give a satisfactory fit with expectation for genotype proportions. These two results cannot be satisfactorily explained by the simple model of a Mendelian population varying only at one locus and with all genotypes of equal fitness. They are instead explained by amending the model so that the population is considered to vary at several loci, the heterozygotes for each locus having a slight advantage.

Theoretically, a bulk progeny from parent plants selected for high yield should contain substantially more heterozygotes than a bulk progeny from unselected parents. This was confirmed by hilum-colour counts, but estimates of yield indicated that the greater heterozygosity was not reflected in any increase in yield; a possible explanation is offered in terms of information theory.

1504 Gagnebin, F.
L'éclatement des téguments et son origine génétique. (**Testa bursting and its genetic origin**).
Rev. hort. suisse 1954 : **27** : 383–84.

Burst testa in beans is attributed to the chance pollination of small-seeded by large-seeded varieties, the resulting seed inheriting the character for large embryo from the ♂ parent and for small testa from the ♀ parent.

1505 Weiseth, G.
Una variedad silvestre del poroto común (*Phaseolus vulgaris*), autóctona del noroeste argentino y su relación genética con variedades cultivadas. [**A wild variety of common bean (*Ph. vulgaris*) indigenous to north-western Argentina and its genetic relationship to other cultivated varieties**].
Rev. agron. Noroest. argent. 1954 : **1** : 71–81.

The wild bean in question was crossed with a number of cultivated forms of *Ph. vulgaris*; its climbing habit proved to be due to a simple dominant, *Fin*, to dwarf habit; it was homozygous for the dominant genes *T*, *V* and *P* for flower colour, *Y* and *Arg* for pod colour and several genes affecting seed colour which are still under investigation.
The F_1 hybrids of these crosses displayed extraordinary vigour and high yielding ability, which in many cases persisted into the F_2. It is therefore thought that the wild species will be useful for breeding purposes. It is highly tolerant of high temperatures and humidity but susceptible to anthracnose (*Colletotrichum lindemuthianum*). The wild bean is regarded as a descendant of the original ancestor of cultivated *Ph. vulgaris*.

1506 Cardona Álvarez, C.
Pudriciones fungosas radiculares del fríjol (*Phaseolus vulgaris* L.) en el valle de Medellín—Colombia. [**Fungous root rots of bean (*Ph. vulgaris* L.) in the Medellín valley, Colombia**].
Rev. Fac. nac. Agron., Colombia 1954 : **15** : 137–209.

In the section devoted to the reaction of varieties to the various root-rot fungi, eight varieties were tested in 1948 with *Sclerotium rolfsii*, *Rhizoctonia solani*, *Macrophomina phaseoli*, *Marasmius* sp., *Pythium debaryanum*, *Fusarium solani* and *F. oxysporum*. The variety Uribe redondo [Round Uribe] was the most resistant to the two most serious fungi, namely *Rh. solani* and *S. rolfsii*, and to the group as a whole, in the seed stage; none were resistant in the growing plant stage. Preliminary tests of 29 types of bean in 1949 showed moderate resistance to *S. rolfsii* in México 348–2 and Blanco [White] and to *Rh. solani* in Ahumado [Smoky] and Rochela, strong resistance to *P. debaryanum* in Moro [Black], Estrada blanco, Caraota negra [Black Caraota], Negrito and México 348–2, strong resistance to *M. phaseoli* in Moro, Blanco, Estrada blanco, Caraota negra, with immunity in Negrito, and strong resistance to the two *Fusarium* species in Negrito, Caraota negra, Estrada blanco and Riñón rojo [Red Kidney].

1507 **Bean rust.**
J. Agric. W. Aust. 1954 : **3** : 439–40.

The runner bean Westralia has been reported as susceptible to *Uromyces phaseoli* var. *typica* when grown at Richmond, NSW (cf. *PBA*, Vol. XXIV, Abst. 2560). The attack on this hitherto resistant variety was attributed to the occurrence of a new race of rust. When grown from certified seed Westralia has maintained its resistance in recent tests; the Richmond line was probably not true to name.

1508 Brien, R. M. & Jacks, H.
French-bean rust (*Uromyces appendiculatus*) in New Zealand.
NZ J. Sci. Tech. 1954 : **36** : 280–84.

Of 40 varieties of dwarf and runner beans tested by artificial inoculation, Westralia was found to be highly resistant, Fullgreen resistant and the rest susceptible or highly susceptible.

1509 **The story of two beans.**
Seed World 1954 : **75** : No. 5 : 50–51.

An account is given of the selection of the mosaic-resistant garden-bean varieties Processor and Tenderbest MR by the Ferry-Morse seed company. Both are tolerant of root rot and produce their main crops slightly later than Tendergreen. Processor is white-seeded, Tenderbest MR has mottled beans. The latter variety is drought resistant.

1510 Thomas, H. R. & Fisher, H. H.
A rapid method of testing snap beans for resistance to common bean mosaic virus.
Plant Dis. Reptr. 1954 : **38** : 410–11. (Mimeographed).

A method of testing plants for the dominant type of resistance to common bean mosaic is described; this type consists of a necrotic response and is derived from the variety Corbett Refugee. After leaf inoculation by rubbing, the plants are placed in a chamber maintained at 90° F. Leaf-vein necrosis usually develops on resistant plants in 3–4 days.

1511 Kawahara, E.
(**Studies on the flowering of the soya bean. I. The relation between illumination and warmth, on the one hand, and flowering on the other**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 317–18. [Japanese].

Under warm night conditions, the flowering date

of the series of varieties investigated was advanced and the duration of flowering extended. When grown in a hot bed, all varieties flowered earlier; in most of the varieties, duration of flowering was extended, but in others duration of flowering was either not affected or was curtailed.
Short photoperiods advanced flowering date; this effect was most marked in the case of the late varieties. Duration of flowering was generally shortened, except in Morse, where it was lengthened.

1512 KAWAHARA, E.
(**Studies on the flowering of the soya bean. II. The relation between flowering, on the one hand, and sowing date and year, on the other**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **20** : 319–20. [Japanese].
A series of 18 varieties was examined at Odate to observe the effect of delayed sowing upon flowering date. In general, the period between sowing and flowering decreased with delay in sowing, but the extent of the decrease was not proportional to the degree of earliness or lateness of the variety.

1513 TJUGINA, E. I.
(**A promising variety of soya bean**).
Zemledelie (Agriculture) 1954 : No. 6 : p. 125. [Russian].
The variety described is semiprostrate in habit, bears its lowest pods 12–15 cm. from the ground and is free from lodging and shedding; its pods are borne in a compact cluster and ripen uniformly; maturity is medium-early and the large seeds do not break on milling; its seed yield has somewhat excelled that of the standard varieties. The variety was produced by the Vsesojuznyĭ Naučno-issledovateljskiĭ Institut Soi i Kleščeviny [Soya Bean and Castor Oil Research Institute] and is named VNIISK7.

1514 ÅKESSON, H.
Funderingar kring ärtsortimentet. (**Considerations on the pea collection**).
Weibulls Allehanda 1954 : 25–30.
Though earliness is an important requirement in peas for northern parts of Sweden, a variety such as W : s Norrland may give a lower total yield than the later maturing W : s Nanna, which is therefore to be preferred from the economic aspect.
Research at Weibullsholm has included the production of (1) hybrid selections of dwarf marrowfats and (2) the breeding of edible-podded marrowfats. Five plump-podded varieties of this type of marrowfat have been bred and approved as first class in official Swedish trials: Apollo/47, Aurora/47, Minerva/50, Olympia/47 and Pallas/47, the first two being tall, and the others dwarf; Apollo/47 and Aurora/47 were the earliest. In general the above five varieties have also proved markedly superior in yield to varieties of the flat-podded type of sugar peas with which they have been compared.

1515 HÄNSEL, H.
Versuche zur Vererbung der Nodienzahl-Blühzeit-Relation im langen Tag bei Erbsensorten (*Pisum sativum* x *Pisum sativum* ssp. *arvense*). Beitrag zur Analyse korrelierter, quantitativer Merkmale im Erbversuch. [**Experiments on the inheritance of the relationship between number of nodes and flowering time in pea varieties under long day conditions (*P. sativum* x *P. sativum* ssp. *arvense*). A contribution to the analysis of correlated quantitative characters in pea experimentation**].
Züchter 1954 : **24** : 97–115.
The inheritance of the above quantitative characters was studied in crosses using Unica, Parel and Limburger Gelbe [Limburg Yellow] as female parents and Vinco as male parent at the Probstdorf Seed Nursery, Vienna. Analysis of the F_2 generations showed that flowering time was controlled by two major genes, with the possible presence of an unspecified number of modifiers; at least one of these two major genes showed a close linkage with *A*, the basic factor for purple colour of flower, but not, as far as could be determined, with *Le*, for length of internode. Varying degrees of linkage were established between the factor pair *A*, *a* and number of internodes and a significant but not large positive correlation existed between number of nodes and length of internode. The high positive correlation found between time from sowing to flowering and time from flowering to maturity is thought to be partly due to selection in horticultural varieties, Lamprecht's experiments in 1946 with *Pisum arvense* vars. *tibetanicum*, *puschki*, *abyssinicum* and *asiaticum* being at variance with the above results. Node number provides a fairly reliable method of estimating flowering time but, as in the case of the F_3 of Unica x Vinco, the correlation between these factors is not always complete.

1516 WIKLUND, K.
Frösättning hos fältodlade ärter, *Pisum sativum* (L.) sens. ampl. Govorov. [**Seed setting in field-grown peas, *P. sativum* (L.) sens. ampl. Govorov**].
Sverig. Utsädesfören. Tidskr. 1954 : **64** : 211–19.

In pea trials in Sweden, unexpected varietal differences in yield are found to occur from year to year. Furthermore, at the Västernorrland Branch Station of the Swedish Seed Association the yellow and grey types of peas often vary greatly in yield and this variability is a serious hindrance to the plant breeder in estimating the cultivation value of new varieties. To elucidate the causes of such variations, investigations are now in progress on the fertility, e.g. set of seeds and pods, in yellow and grey peas in different parts of Norrland.
Though the number of single or paired pods was much higher in the yellow varieties than in the grey peas, the number of aborted fertilized seeds was high, particularly in the yellow forms, which also gave a lower yield of seeds than the grey peas.
Seed yield was negatively correlated with pod number in the yellow peas and other varieties tested. Abortion frequency was closely correlated with pod number. The number of unfertilized ovules averaged 11% for the grey peas and 20% for the yellow peas.
Fertility in peas grown in northern Sweden seems to depend on varietal differences in their climatic requirements and on the competition for the supply of nutrients to various organs of the plant.

1517 YEN, D. E.
Seed variation in pea rogues.
NZ J. Sci. Tech. 1954 : **36** : 117–21.

In investigations on a commercial sample of the pea Onward, rogues did not differ from normal individuals in seed yield per plant but differed significantly in seed number per plant and single-seed weight. Low seed weight was associated with high number. Differences in seed number and weight were also noted between lines of rogues and between lines of normal plants; these differences were heritable.

1518 LEHMANN, C. O.
Das morphologische System der Saaterbsen (*Pisum sativum* L. sens. lat. Gov. ssp. *sativum*). [**The morphological classification of the garden pea (*P. sativum* L. sens. lat. Gov. ssp. *sativum*)**].
Züchter 1954 : **24** : 316–37.

The morphological characters of 100 botanical varieties are given, together with notes on synonyms and geographical distribution in each case. A proposed revision of the systematics of this subspecies is outlined, based upon a natural grouping according to growth habit, length of stalk, shape of leaf, size of pea, colour of seed coat and cotyledon, and colour of the flower and pod.

1519 FUJITA, T. & MITSUISHI, S.
(**Cytological studies on the root nodules of peas**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1953 : **22** : 97–98. [Japanese].

Amitosis and nucleolar budding were observed in the nodular tissue; the cells of the nodule meristem were found to be tetraploid ($2n = 28$) in contrast to the normal diploid cells of the root tip.

1520 PANDYA, P. S., PATIL, J. A. & CHAUDHARY, B. B.
"Round and tiny" leaf mutant's in *Cajanus cajan* Millsp.
Poona agric. Coll. Mag. 1954 : **45** : p. 18.

A mutant possessing obovate leaflets with rounded base and apex and a dwarf mutant bearing very small leaflets have been observed at the Agricultural Research Station, Niphad, Bombay.

1521 ANDERSON, E. & BROWN, W. L.
Ladyfinger and Tom Thumb, two old varieties of popcorn.
Ann. Mo. bot. Gdn. 1954 : **41** : 301–04.

The above two small-kernelled popcorns are described and also distinguished from each other. The high-quality but very late variety Ladyfinger may be one of the oldest popcorns. It is strikingly similar to popcorns obtained from pre-Columbian graves in Chile and Peru; varieties fairly similar to it have been found in scattered localities in South America, and it bears a general resemblance to popcorns collected among the Naga tribes of Assam (cf. *PBA*, Vol. XXI, Abst. 1009). In growth habit Tom Thumb is very similar to the early-maturing, small-eared northern flint varieties such as those grown by the Micmac Indians. Since Ladyfinger and Tom Thumb represent morphologically extreme types they may be useful in breeding.

1522 TSUDA, C.
(**Fundamental studies on mint. I. On the chromosome number of Hokkaido and Chinese mints**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1952 : **21** : 178–79. [Japanese].

The Japanese variety Hokushin [Hokkaido

Gift] and the Chinese variety Miao-hsing-chen, both pertaining to *Mentha arvensis* var. *vulgare*, each have 96 somatic chromosomes in contrast to the 64 chromosomes of other Japanese varieties.

BOOK REVIEWS

LINDER, A.
Planen und Auswerten von Versuchen. **(Planning and calculation of the results of experiments).**
Verlag Birkhäuser, Basel/Stuttgart 1953 : SFr. 21.–. : Pp. 182 : tables.

This is an expository manual, of convenient size, of those methods, statistical and arithmetical, which have come to be known by the general name of Field Experimentation. Written by the Professor of Mathematical Statistics in the University of Geneva, the publication should be useful as making available in German a corpus of knowledge that is not readily available in other languages than English. Apart from references and tables, the book is in seven sections. The first is introductory, and includes a description of the basic statistical tests that are to be used later. Section 2 deals with the randomized block experiment, including interacting treatments and orthogonal components. The author then goes on to Latin squares, split-plot designs, factorial systems, confounding of the (2^n) pattern, and incomplete blocks. The system throughout is to illustrate the methods and the arithmetical details through a series of worked examples. The last section provides a justification for the methods by giving a mathematical model analysis of the pattern usually favoured by those working in this field. J. W.

KEMPTHORNE, O., BANCROFT, T. A., GOWEN, J. W. & LUSH, J. L. (EDITORS)
Statistics and mathematics in biology.
Iowa State College Press 1954 : $6.75 : Pp. 632 : figs. : tables.

This book consists of a collection of most of the papers given at a "Biostatistics Conference" held in June-July 1952, arranged by Iowa State College and having the Eastern North American Region of the Biometrics Society as joint sponsor. The idea of the conference was to bring together biologists and statisticians (or mathematicians) in order to advance the unified approach to biological problems. The papers are grouped in five sections: I. General Biometrical Principles and Procedures (12 papers), II. Changes in Population Number (3 papers), III. Estimation of Populations (8 papers), IV. Determination of Biological Response (10 papers), and V. Genetical Analysis of Populations (11 papers). Within sections there is considerable variation in the subject matter of the papers, but there are many, written by well-known authorities, which are of considerable value to those concerned with the mathematical and statistical methods used in handling biological material. J. W.

HOEL, P. G.
Introduction to mathematical statistics.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1954; 2nd Ed. : 40s. : Pp. xi + 331 : figs. : tables.

This book is one of an extensive series of the Wiley publications in statistics, and is the elementary volume out of those devoted to mathematical statistics. Really good books of this character are still rare, and the work under review is to be commended for the careful and accurate way in which it has been compiled, particularly now that a chapter on probability had been added at the beginning. The proofs given are suited to readers with a knowledge of mathematics at an intermediate level; elementary, but not advanced, calculus is required for their proper understanding. The chapters run through the usual series of processes and tests, up to small sample distributions; in addition the general principles for testing hypotheses and for estimation are described, while statistical design in experimentation finds a place, and there is a useful last chapter on nonparametric methods. A large number of practical exercises have been provided, and the book is self-sufficient in providing its own statistical tables. Standard methods can be easily learnt from such a text-book, while it is refreshingly up-to-date on methods which have not long been current. J. W.

LEA, D. E.
Actions of radiations on living cells.
Cambridge University Press 1955 : 2nd. Ed. : 30s. : Pp. xiv + 416 : 61 figs. : 4 plates : 86 tables.

A book on biology written by a physicist is a rare thing and for this reason, more than any other, the reprinting of this work by the late

Dr. Lea, first published in 1946 (cf. *PBA*, Vol. XVII, p. 358) is to be welcomed. The text has been reproduced almost intact by a photolithographic process and attempts to bring it up to date have been mainly confined to the provision of an appendix, which incorporates a certain number of additions to the text which the author had made during his lifetime; they do not materially alter his argument. There have been some corrections and amplifications by Dr. L. H. Gray, who has also corrected some of the misprints in the original text and added some thirty more references to the bibliography; the claim of the publisher that "together, these bring it up to date" would seem to be an overstatement. The book is of value mainly as an exposition of how, over ten years ago, a gifted physicist viewed the mechanism of action of the main types of radiation then being applied to biological phenomena.

HEBERER, G. (EDITOR)
Die Evolution der Organismen. (**The evolution of organisms**).
Gustav Fischer Verlag, Stuttgart 1954–55 : Lieferung 1, DM 12.10; Lieferung 2, DM 17.70; Lieferung 3, DM 20.20; Lieferung 4, DM 9.90 : Pp. 856 : figs. : plates : tables.

The second and enlarged edition of this work is planned to come out in five Lieferungen of which four have been now received. The whole work is intended to present a comprehensive review of the present state of evolutionary theory both in respect of plants and animals; all the contributors subscribe more or less wholeheartedly to current neo-Darwinian theory.

The first Lieferung is the most theoretical. It opens, in traditional German style, with an article by H. Dingler on the philosophical basis of the theory of descent. This deals with such problems as the nature of causality, the distinction between living and nonliving systems, teleology, holism and morphological form. The treatment is on rather a superficial philosophical level and only sometimes gets to grip with the fundamental philosophical issues involved. The second paper, by W. Zimmermann, is a survey of the principal types of biological data that are relevant to evolutionary theory, in particular the evidence provided by taxonomy, morphology, homologous equivalence and fossil lineages. There is an interesting discussion on the various types of genealogical patterns that can connect evolving organisms, also some pertinent remarks on the scientific and epistemological status of phylogenetic statements. On the other hand, not everyone will condone such attempts to represent the course of evolution as the evolutionary tree of the plant kingdom on p. 95. B. Rensch, whose *Neuere Probleme der Abstammungslehre* is perhaps the best general introduction to evolutionary theory in German (cf. *PBA*, Vol. XX, p. 178), contributes the next article on the evolutionary significance of ontogeny. This account is largely factual and deals with such questions as the evolutionary significance of ontogenetic stages, the importance of the relative timing of different development processes in explaining divergence in adult morphology, and neoteny. The last paper of the first Lieferung is by K. Lorenz and is concerned with the evolution of behaviour traits and intelligence in animals and man. Here, the difficulty and comparative novelty of the subject forbid one to expect a polished and integrated theory. However, the author is able to discuss numerous interesting cases of obvious relevance to evolutionary theory, even though their relative importance and precise role is highly uncertain.

The second Lieferung takes us down to a somewhat more concrete level than the first. The opening paper is by L. Rüger on the absolute chronology of the fossil record; it covers much the same ground as Zeuner's *Dating the Past.* The next contribution is a posthumous article by J. Weigelt on the interpretation of the fossil record. This paper is mainly zoological and is of special value for its illustrations of how to deal with fossil lineages and synchronous and successive variation in fossil collections. Viruses and the origin of life are treated next, by H. Friedrich-Freksa. This account covers such recent developments as virus mutations and recombination, hypotheses on the origin of viruses, the twin-helical structure of deoxyribonucleic acid, and Jordan's theory of the unitary origin of life based on the exclusive occurrence of l-aminoacids under natural conditions. These problems are all highly complex and the author's treatment is perhaps rather too sketchy to do them justice. The two final articles of this Lieferung present outlines of the putative course of evolution in plants and animals respectively. The paper on plants is by K. Mägdefrau. Except for some of the ferns, there is very little satisfactory paleobotanical evidence as to the interrelationships of the various major taxonomic groups. This paper is therefore little more than a straightforward comparative morphological account of the major fossil and existent plant phyla. The case is rather different for the animals, which are dealt with by A. Remane. Here the abundance of

fossil remains provides a more adequate basis for phylogenetic conjecture, and one can probably accept some of the evolutionary trees presented with more confidence than the corresponding devices for the plants.

Lieferung III opens with a detailed and comprehensive review of modern cytogenetical research bearing on the evolution of plants by F. Schwanitz. Mutation, chromosome aberrations, aneuploidy and polyploidy are treated in turn and special attention is devoted to isolating mechanisms and to the crossing polygons of the type worked out by J. Clausen. The work of P. Michaelis on cytoplasmic inheritance is accorded a prominence unusual in neo-Darwinian treatises. A complementary account of animal cytogenetics and evolution by H. Lüers and H. Ulrich follows. This deals chiefly with chromosomal differentiation in *Drosophila*, mutation and selection in wild *Drosophila* populations, and at length with numerous cases of racial differentiation of the type reviewed by E. Mayr in his *Systematics and the origin of species* (cf. *PBA*, Vol. XIII, p. 378). The final article in this Lieferung is by W. Ludwig and deals with the theory of selection. This paper has an historical introduction and then passes to a discussion of the Weinberg-Hardy formula and so to the theories of population genetics of R. A. Fisher and S. Wright. The mathematics necessary in this section is kept well in hand, and the article concludes with a consideration of objections to the neo-Darwinian formulation, in particular those of R. Goldschmidt and O. Schwindewolf. The difficulties are considered with an impartiality rare in neo-Darwinian writings, though the author's answers to the objectors are not always convincing.

There are only two articles in Lieferung IV, dealing respectively with the evolution of cultivated plants and of domestic animals. F. Schwanitz, already referred to, deals with the plants, and provides a useful review of such topics as the special characteristics of cultivated as against wild plants, in particular gigas characters, parallel variation, the cytogenetics of crop plants, centres of origin of crop plants, following along Vavilov's lines, breeding as an evolutionary process, and the limits beyond which further improvement by breeding may not be possible. The corresponding article on animals, dealing principally with cattle, pigs, dogs and birds, is by W. Herre.

The last Lieferung is to deal with human evolution. Its publication will complete a monumental record of the state of evolutionary theory at the present time.

KITCHING, J. A. (EDITOR)
Recent developments in cell physiology.
Butterworths Scientific Publications, London 1954 : 40s. : Pp. x + 206 : figs. : tables : plates.

The Colston Symposia organized by the University of Bristol have covered such diverse fields of study as cosmic radiation, colonial administration, the suprarenal cortex and insecticides. The 1953 Symposium was devoted to cell physiology and the proceedings appear in this handsome volume, in which several contributions are of interest to readers of *Plant Breeding Abstracts*. Thus in A study of bacterial populations in which nuclear and cellular divisions are induced by means of temperature shifts, O. Maaløe and K. G. Lark describe experiments in which cultures of *Salmonella typhimurium* were subjected to alternating temperatures of 25° and 37° C; the former temperature suppressed cell division, which resumed immediately at 37° C at a rate about twice the normal for that temperature. There was also a sharp rise in the rate at which cells became lysogenic when cultures containing phage A were raised from 25° to 37° C. Cytological examination showed a rise in the proportion of cells with four rather than two nuclei during the period from 5 to 10 minutes after raising the temperature; cell division, restoring the normal number of nuclei, occurred some 12–15 minutes later. In Environmental and genetic control of differentiation in *Neurospora*, M. Westergaard and H. Hirsch present evidence showing a causal relationship between tyrosinase activity and melanin formation on the one hand and differentiation of female sex organs on the other. One of the enzymes involved in melanin metabolism is sensitive to temperature and it thus becomes possible to block differentiation. The addition of tyrosine and tyrosinase to certain sterile mycelia induced the formation of protoperithecium-like structures, suggesting that some of the tyrosinase-melanin intermediates have a morphogenetic capacity in the formation of protoperithecia.

In Synchronous divisions in mass cultures of the ciliate protozoon *Tetrahymena pyriformis*, as induced by temperature changes, E. Zeuthen and O. Scherbaum show that cells resume synthetic activity after temperature shifts more rapidly than they resume division. In Nuclear control of enzymatic activities, J. Brachet shows that in enucleate halves of amoebae the enzymes associated with mitochondria remain unaffected, soluble proteins are only slightly

affected, and RNA and enzymes bound to the microsomes disappear altogether. Nuclear control of enzymatic activities is more complex than was expected, as various proteins behave very differently after removal of the nucleus. In *Acetabularia* incorporation of labelled CO_2 is identical in nucleated and enucleate fragments at first but falls off after 2–3 weeks in the enucleate fragments, and it is again concluded that the nuclear control is a remote one, possibly through the microsomes. In Deoxynucleic acid in some gametes and embryos, E. Hoff-Jørgensen describes a microbiological method which permits the determination of a few μg. of DNA, and in Cellular oxidations and the synthesis of amino-acids and amides in plants E. W. Yemm describes experiments with barley seedlings and food yeast which give some support to the hypothesis of peptide-bond formation by transamidation and transpeptidation, suggesting that the action of specific surfaces, visualized in the 'template' hypothesis, operates at a later phase of protein synthesis by affecting the folding and cross-bonding of polypeptide structures. The role of nucleic acids in protein formation may be at this stage, rather than in the direct synthesis of peptide bonds. The discussions that followed the papers are fully reported; the whole volume is admirably printed and presented and will make a valuable addition to any library of works dealing with matters relating to cell life.

Falck, R. & Falck, M.
Die Bedeutung der Fadenpilze als Symbionten der Pflanzen für die Waldkultur. (**The importance for sylviculture of mycelial fungi as symbionts of plants**).
J. D. Sauerländer's Verlag, Frankfurt/Main 1954 : DM 8.80 : Pp. 92 : 20 figs.

This slender volume embodies the fruits of much of Dr. Falck's researches carried out since 1923, a large part of his records having been destroyed as a result of the war. It gives a review of the development of ideas concerning the role of the mycorhiza which appear so frequently in the roots of higher plants, tracing the gradual steps that have led to the recognition of their role in supplying nutrients to the host plant. First the possibility of their supplying mineral nutrients was admitted but they are now seen as purveyors of ready-made organic nutrients, consisting of carbohydrates, proteins and water drawn directly from the humus of the soil. This system of nutrition, referred to as mycotrophy, is regarded as particularly important in forest trees though it is found in 75% of all the higher plants, in degrees varying from full mycotrophy in some parasitic species to occasional mycotrophy under exceptional, usually unfavourable, soil or other conditions. Under these conditions the capacity to turn to a symbiotic mode of nutrition is regarded as a feature promoting natural selection in a given species. The authors further maintain that plants, together with all other living organisms, possess vital forces over and above the forces of chemistry and physics alone, making them capable of using these forces in a manner of their own, which is usually more simple and efficient than the way they are used in chemical laboratories or factories, and is in no way a direct outcome of inorganic forces alone.

Tukey, H. B. (Editor)
Plant regulators in agriculture.
Chapman & Hall, Ltd., London 1954 : 44s. : Pp. x + 269 : figs. : tables.

It may surprise some readers to learn from Dr. Tukey's introduction to this composite volume on plant regulators that the word hormone was first used in 1906. We are nevertheless right in regarding the subject of plant growth substances as one of the newest branches of biology and one in which development in recent years has been most rapid. A general review of the different fields, contributed by 17 acknowledged experts, is thus to be welcomed. The historical introduction by Dr. Tukey contains the report of a committee of the American Society of Plant Physiologists on Nomenclature of Chemical Plant Regulators. Chapter 2 outlines the principles of plant growth and states how it is affected by plant regulators, the chemical nature of which is explained in Chapter 3; there follow chapters dealing with the use of plant regulators in stimulating root development, flowering and fruit setting, and in the production of parthenocarpic fruits in tomatoes and various fruits, in controlling maturity, prolonging storage life, controlling abscission and defoliation, preventing preharvest drop of fruits, delaying bud development and sprouting and in weed control. Chapter 11, by S. L. Emsweller, is on Plant regulators and plant breeding and gives some useful information on how the fruit set can be increased by use of growth regulators when making artificial pollinations of cantaloupes and Lima beans. Several methods of overcoming self and cross incompatibility are described, reference being made to experiments by the author and colleagues on the use of such growth regulators as 3-indolebutyric

acid, 3-indoleacetic acid, α-naphthaleneacetic acid, α-naphthaleneacetamide, and 2,4,5-trichlorophenoxyacetic acid. The chemicals were dissolved in lanolin at concentrations of 0·1 to 1·0%. The most effective was the 1% α-naphthaleneacetamide and directions are given for its preparation and its use with various species of *Lilium*.

A final chapter deals with equipment and methods of application.

WHITE, P. R.
The cultivation of animal and plant cells.
Ronald Press Company, New York 1954 : $6.00 : Pp. xi + 239 : 54 figs.

Dr. White has himself made valuable contributions to the methodology and findings of *in vitro* culturing of animal and plant material and is therefore well qualified to write on a means of investigation likely to be of growing importance in several biological fields, of which embryo culture in plant hybridization is one. As he informs us in the foreword, he has had three objectives: "To present all the major techniques of cell culture for both plant and animal materials in a sufficiently extended and detailed fashion so that they can be used by all those who may choose to enter the field professionally; to present a group of simple techniques by which anyone without previous experience beyond that of a good biology course may be able to make interesting and effective, if less professional, cultures and may perhaps be led gradually into the greater refinements of the field ; and to emphasize as adequately as is conveniently possible the essential importance of the cell itself, as the basic physiological entity out of which all those societies called "organisms" (or at least almost all of them) are constituted." Dr. White strongly disapproves of the term "tissue culture," regarding it as a long-standing misnomer since tissues are not cultured but rather individual cells composing a tissue or organ: hence his title. The first chapter, The cell versus the organism, is concerned with pressing home the concept of physiological cellular autonomy; this scrappy and unconvincing chapter falls below the high standard of the remainder of the book. Chapter 2 consists of an historical survey. In the next half-dozen chapters and the appendix, giving information on techniques, the author fulfils his first two aims with distinction. In chapter 3 he discusses the animal and plant material suitable for culture and in chapter 4 describes the laboratory accommodation and equipment required. Chapter 5 deals with nutrients, chapter 6 with types of cultures, chapter 7 with the setting up of cultures and chapter 8 with growth measurements and their interpretation; the appendix provides details on simple techniques for beginners. The final chapter gives a short account of the various applications of cell culture. A bibliography and author and subject indexes complete the book, which is for the most part a stimulating introduction to the subject and is illustrated by excellent diagrams and photographs.

BROWN, R. & DANIELLI, J. F. (EDITORS)
Symposia of the Society for Experimental Biology. Number VIII. Active transport and secretion.
Cambridge University Press 1954 : 45s. : Pp. vi + 516 : figs. : tables : plates.

The 1953 Symposium of the Society for Experimental Biology was held at Bangor, the subject for discussion being active transport. The correct definition of this concept is considered in the third article of the symposium by T. Rosenberg. Two equally inelegant definitions are suggested: active transport is (1) "the transport of substances across one or more cell membranes which is influenced not only by the force responsible for passive diffusion, but also by other forces which are maintained and regulated by the metabolism of the cell"; alternatively, is (2) "the movement of a substance which is influenced by other forces in addition to the chemical (or analagous) potential gradient of this substance." Active transport has been extensively studied in recent years both in plant and animal material, and promises to throw an important light on the basic physiology of the cell.

Two general reviews open the symposium. The first, by J. A. Ramsay, deals with water transport in invertebrates; the second, by H. Davson, deals with the same phenomenon in invertebrates.

Next, following the paper by T. Rosenberg already mentioned, are four papers concerned with the active transport of water. J. R. Robinson considers the problem in general terms; J. A. Kitching deals with the matter with special reference to animals without kidneys; while D. C. Spanner tackles the question from the thermodynamic angle and shows how active transport of water could result from microgradients in temperature. The last paper in this section is by J. W. L. Beament and deals with insects, laying special emphasis on the role of the waxy layer.

Active transport of organic compounds is the subject of the following four papers. P. G. LeFevre presents the results of a kinetic study of the movement of monosaccharides across the membrane of primate erythrocytes, while W. Wilbrandt, in a general review of the kinetics of the transport of nonelectrolytes across intestine and kidney epithelia and through erythrocyte membranes, concludes that a membrane-carrier mechanism offers the best explanation of the available data. A short note on the kinetics of active transport by W. F. Widdas is in general agreement with the two preceding contributors. An important paper by A. Rothstein reports experiments on the uptake of sugars by yeast and on the metabolic processes coupled therewith; it is suggested that glucose can only enter the cell after phosphorylation in the ectoplasm. Active transport of complex organic compounds is returned to later in the symposium when F. W. R. Brambell and W. A. Hemmings discuss the passage of antibodies through the fetal membranes of the rabbit, and A. C. Frazer reviews the transport of lipids.

A number of papers deal with electrolytes. Cation movement across nucleate and enucleate erythrocytes is discussed by M. Maizels; a more detailed study of the coupling of Na^+ and K^+ transfer in human erythrocytes follows by E. J. Harris. E. F. Gale is concerned with the accumulation of glutamic acid in *Staphylococcus aureus*. P. Mitchell studies the general question of phosphate movement. A controversial paper by H. Lundegårdh defends and elucidates the notion of anion respiration which is believed to be associated in particular with the cytochrome system. E. J. Conway discusses the movement of Na^+ and K^+ across yeast membranes with special reference to the redox-pump theory. Three papers are specifically concerned with active transport of ions in higher plants. The first, by J. F. Sutcliffe, describes absorption of Na^+ and K^+ by beet disks; evidence was obtained that combination between ion and carrier does not require metabolic energy. Next, R. Scott Russell shows that the ascorbic-acid oxidase system may be coupled with ion transport and proceeds to a discussion of ion accumulation. The third botanical paper is by F. C. Steward and F. K. Millar who show how ion absorption depends on the physiological state of the cell; in particular, they report that ion absorption is greater in nongrowing vacuolate cells than in dividing cells. The remaining papers on active movement of ions are by H. H. Ussing, who describes the movement of Na^+ across frog skin and shows how this results in a difference in electric potential between the two surfaces, A. L. Hodgkin and R. O. Keynes, who deal with ionic flux in nerves, and H. Burr Steinbach, who considers Na^+ and K^+ balance in frog muscle.

The fact that active transport may occur at the intracellular level is demonstrated by R. E. Davies, who, after discussing ion movement in brain and kidney slices, shows that many substances are actively transported into mitochondria.

The symposium concludes with an article by J. F. Danielli, pointing out the necessity for further research into the structure of cellular and intracellular membranes and of pinocytotic cells, into the enzyme systems coupled with active transport, and into the molecular mechanism of active transfer.

STRUGGER, S.
Über die Struktur der Proplastiden. (**The structure of the proplastids**).
ForschBer. Wirtsch.- u. Verkehrsmin. Nordrhein-Westfalen No. 83. Westdeutscher Verlag, Köln & Opladen 1954 : DM 8.40 : Pp. 27.

Observations on *Chlorophytum comosum* are described and illustrated in this research monograph in support of Professor Strugger's earlier work on *Agapanthus*, which showed the proplastids to be comprised of a solid, deeply staining core surrounded by a stroma which stained only slightly. In this they are clearly distinguishable from the chrondriosomes, in which no organized structure is detectable. The division of the proplastids is also described. The observations confirm Schimper's principle of the continuity of the plastids.

ENGLER, A.
Syllabus der Pflanzenfamilien. (**Syllabus of plant families**).
Gebrüder Borntraeger, Berlin-Nikolassee 1954 : DM 40 : Pp. 367 : 140 figs.

The eleventh edition of what must be the most generally used of all taxonomic handbooks appeared in 1936. The first volume of the twelfth edition, dealing with the entire plant kingdom excepting the angiosperms, has now appeared, and has been thoroughly revised and entirely rewritten under the editorship of Prof. H. Melchior and Prof. E. Werdermann; even the illustrations are different, the old blocks having been destroyed in the war. Unlike the eleventh edition, which was the sole production of Prof. L. Diels, the present edition is, to a large extent, a collaborative work, Dr. E. W. Schmidt being responsible for the bacteria,

Cyanophyceae and Myxophyta, Prof. H. Skuja for the recently established Glaucophyta, Prof. H. Beger for various of the algal groups, Dr. W. Krieger for the Chrysophyta, Dr. F. Mattick for the lichens, Prof. H. Reimers for the Bryophyta and Pteridophyta, and the late Prof. R. Pilger for part of the gymnosperms.

The old introduction by Prof. A. Engler has been discarded in favour of a more up-to-date survey of taxonomic principles. The editors have wisely adhered as closely as possible to the general layout of the earlier editions and departures from the older scheme of classification have been kept to a minimum. Among the new features are synopses to the orders and literature references for each major division.

There is no doubt that the present volume represents a marked improvement on its predecessor and will be as widely used. The only drawback is the publication of the *Syllabus* in two volumes so that it will no longer be possible to look up all one's taxonomic queries in a single volume.

Flore du Congo Belge et du Ruanda-Urundi. Spermatophytes. (**Flora of the Belgian Congo and Ruanda-Urundi. Spermatophytes**).
Institut National pour l'Étude Agronomique du Congo Belge, Bruxelles 1954 : 5: Pp. 377 + vii : 25 figs.

The first three volumes of the flora were reviewed in *PBA*, Vol. XXIII, p. 342. Since then, a volume has been issued dealing with a part of the Leguminosae (cf. *PBA*, Vol. XXIV, p. 482). The present volume, which continues with the Leguminosae, and covers tribes Galegeae and Hedysareae of the Papilionaceae, maintains the same high standard as its predecessors.

Norman, A. G. (Editor)
Advances in agronomy. Volume VI.
Academic Press Inc., New York 1954 : $8.00 : Pp. xi + 383 : figs. : tables.

The 1954 volume of this useful series contains several contributions of interest to plant breeders. In A pattern for international collaboration in agriculture, J. G. Harrar gives an enlightened account of the cooperative research carried out between the Rockefeller Foundation and the local agricultural scientists in Mexico and Colombia and of the various problems, economic, psychological and political as well as purely scientific, involved. The Mexican project has embraced the improvement of maize, wheat and beans (cf. *PBA*, Vol. XXIV, Absts. 1881, 1926 and 1937) and we learn that currently nearly a fourth of Mexico's corn acreage is planted to improved varieties with average increases in yield of from 25 to 30%. Yield increases of from 30 to over 50% are reported for wheat. Research with sorghum has added this to the grain crops in the arid districts of Mexico. Other projects include testing the world wheat collection for resistance to races of stem and other rusts in Mexico, Colombia and Peru and testing the world barley collection in Mexico and Colombia, studies of the resistance of potato varieties to races of *Phytophthora infestans* in various countries and cooperation in the establishment of banks of maize germ plasm. In Seed-flax improvement, J. O. Culbertson gives an introduction and edits the article as a whole, showing that the USA is now more than self-supporting in linseed; individual sections are contributed by separate authors: H. H. Flor writes on Flax rust, outlining the work that has been done on physiological races, the inheritance of pathogenicity in the rust organism and breeding resistant forms; a table is given showing the 18 varieties now used to differentiate races of flax rust, together with 14 supplemental varieties; these are varieties which are considered less satisfactory but some of which are used by other investigators to differentiate local races. By back-crossing to Bison, a series of lines is being selected, each of which is pure for one rust-conditioning gene and has the agronomic type, wilt resistance and pasmo tolerance of Bison. The maintenance of diversity in the rust-resistant germ plasm is one of the safeguards against the penetration of virulent South-American rust races, to which all the varieties now grown in the USA are susceptible. J. J. Christensen writes on The present status of flax disease other than rust, commenting briefly upon the occurrence of physiological specialization in *Fusarium lini*, *Rhizoctonia solani*, *Polyspora lini* and certain other organisms, the development of resistant varieties and the inheritance of resistance; J. O. Culbertson himself writes on Breeding, giving an outline of the method used at the Minnesota Agricultural Experiment Station, a brief summary of what is known on the inheritance of agronomic characters such as plant height, seed size, seed yield, oil content, iodine number and resistance to herbicides, the cytology of the genus *Linum* and the varieties developed in the USA; problems envisaged for the future consist mainly of breeding varieties resistant to diseases, old and new, and to herbicides. J. R. Quinby and J. H. Martin give a very comprehensive review entitled Sorghum

improvement, where developments as striking as those in any major crop in the USA have taken place in the last fifteen years; a reduction of 2 ft. in height has made it possible to harvest by combine; other changes include (1) expanded production into northern and high-altitude areas having a short growing season, (2) industrial uses of sorghum, (3) new disease-resistant varieties, (4) forage sorghums having palatable seed and (5) forage sorghums low in prussic acid. We learn that sorghum is now grown on 16 million acres in the USA, about 42% of it being harvested for grain, 50% for forage, 5% for silage, 1% for syrup, and 2% for broomcorn. Another 3 million acres is under Sudan grass. The pedigrees of the combine grain sorghums are given, and a full account is given of the development of sorghums resistant to milo disease caused by *Periconia circinata* by selection of resistant mutants, of strains resistant to the various sorghum smuts and to chinch bugs, of the various improved strains of forage sorghum, including forms with palatable seeds, all resistant to bacterial leaf blights, and the various disease-resistant sweet Sudan grasses; also the replacement of maize in many northern areas by quick-maturing grain sorghums, which have made it possible to grow grain sorghum on some 200,000 square miles in northern latitudes or high altitudes where the frost-free period is too short for the safe growing of the later varieties formerly available. Other developments include waxy sorghums producing a substitute for cassava starch, sorghums suitable for syrup, and heavy-yielding varieties such as Tracy which yield from 20 to 30 tons of green fodder per acre, so much in fact that hardly any farmer will grow them! Among the hints for sorghum breeders in the section on breeding is the suggestion that pure-breeding lines might be obtained through somatic reduction following colchicine treatment. Cytogenetic considerations lead the authors to conclude that the cultivated grain and grass sorghums with the somatic chromosome number 20 all constitute a single species and that gene transfer from one to the other should be relatively simple. An outline is given of the published information on the genetics of characters that affect production, adaptation and economic value; in studying the endosperm it was discovered that several characters are counterparts to characters known in maize, such as yellow endosperm containing vitamin A, waxy endosperm in which the starch consists of amylopectin and sugar, floury and pop sorghums; some of them have been observed to arise by mutation. In work on hybrid vigour in sorghum the fact has emerged that F_1 hybrids differing in only one gene can give grain yields differing by 25% and more; increases of 43% in plant weight have been obtained in Sudan grass by the use of hybrid seed. The various male-sterile types that are now available in sorghum are referred to in connexion with this use in the production of hybrid grain sorghums, which are nearly ready for release now in the USA.

In Crop adaptation and climate C. P. Wilsie and R. H. Shaw summarize published information on ecotypes, the origin of crop plants, the various factors affecting crop adaptation such as moisture, temperature, light and their interaction, climate and soil formation, and the factors affecting crop yields.

Other topics treated in this issue are Progress in range improvement by E. H. McIlvain and D. A. Savage, Requirement and availability of soil water by O. J. Kelley, New concepts of management of corn belt soils by S. W. Melsted, Technological aspects of trace element usage by A. A. Nikitin and Potassium in plant nutrition by K. Lawton and R. L. Cook.

Rose, G. J.
Crop protection.
Leonard Hill, Ltd., London 1955 : 30s. :
Pp. xxi + 223 : 113 figs. : 13 tables.

We are glad to read in the introductory remarks of this book on crop protection that "although chemicals today are often indispensable as immediate remedies, all the chemicals in the world will not replace good husbandry." The use of resistant strains of crops is included among the elements of good husbandry. A farmer is recommended to satisfy himself that he has no other remedy available for coping with a problem in one of his crops before deciding to apply chemicals. Having decided to do so he will find this book a useful guide to the forms in which the chemicals may be obtained and applied for treating different enemies. The characteristics of the main chemicals used are described in turn, starting with weed killers, passing to insecticides, fungicides and finally—reader, take a breath—rodenticides. The main types of machinery for applying these products are described and a few words are given on the protection of stored products; a final summary tabulates the dosages of the main products used for treating the ailments of the different crops, which are arranged alphabetically.

The volume is supplied with a large number of photographs, including some excellent colour prints illustrating the insect pests, and will

serve as a valuable reference work not only to farmers but to plant breeders and others whose work involves growing crop plants in a healthy state.

ROEMER, T., SCHEIBE, A., SCHMIDT, J. & WOERMANN, E.
Handbuch der Landwirtschaft. II. Scheibe, A. Pflanzenbaulehre. (**Text Book of Agriculture. Vol. II. Scheibe, A. Plant production**).
Paul Parey, Berlin & Hamburg 1953 : DM 66 : Pp. xix + 775 : 184 figs. : tables.

From the many changes that have taken place in German agriculture during and since the war, it became clear that an up-to-date text book was needed that would take into consideration the advances made in mechanization and other modern methods of crop production.

Readers familiar with the Becker-Dillingen series of text books composing the *Handbuch des gesamten Pflanzenbaues* will be glad to learn that a second edition of the somewhat similar series of textbooks, bearing the general title of *Handbuch der Landwirtschaft* and dealing with various branches of agriculture, has appeared under the editorship of the late Professor T. Roemer and Professors A. Scheibe, J. Schmidt and E. Woerman.

The second volume, entitled *Pflanzenbaulehre*, of which Professor Scheibe is editor and part author, contains an immense amount of erudite and practical information on numerous agricultural, horticultural and medicinal plants and on herbs whose cultivation is of importance in Germany.

The general plan adopted has been to provide an initial account of the history and origin of the particular crop, followed by information concerning its botanical status and characteristics and by observations on its requirements regarding soil and climate, on the many aspects of cultivation, and on the control of diseases and pests and the utilization of the harvested product. In some cases chromosome numbers are also cited and the advances that have been made in breeding are mentioned.

The wide range of the work will be evident from the following description of its contents:—

Chapter I, by the late Professor Roemer, deals with the cereals of the temperate zone : rye, wheat, barley and oats, while Chapter II, by Prof. A. Mudra, is concerned with maize and the millets and sorghums, much attention being given to their systematic classification. Prof. P. Pelshenke has contributed a section on cereal quality, bread and foodstuffs, and Prof. E. Klapp a chapter on the potato. Chapters on legumes and oil crops, dealt with by Professors O. Heinisch, A. Scheibe and E. Boguslawski respectively, are followed by Prof. A. Tiemann's discussion of fodder crops and catch crops and another contribution by Prof. E. Klapp on meadows and pastures. Hemp and flax are the subjects of sections by Prof. R. Weck and by Prof. P. Koenig, and Prof. E. Heeger is the author of the section on herbs and medicinal plants. The three concluding chapters contain contributions on fruit growing by Prof. F. Hilkenbäumer, vegetable growing on a field scale by Prof. W. Nicolaisen and hop growing by Dr. W. Link.

The work is provided with a 27-page index which includes a list of subjects and a list of the taxa treated in the text. A bibliography of recent relevant literature appears at the end of each section of the book, which also includes 184 illustrations.

The volume attains a high standard in the quality of the printing and paper; a useful feature is the provision of equivalents in English, French, Spanish and, in some cases, Italian, for the various German and Latin names of the crops; this feature is somewhat marred by a certain recklessness as regards the use of singulars and plurals, masculines and feminines, and in one or two cases, the crop equivalents.

ANDERSON, E.
Plants, man and life.
Andrew Melrose, Ltd., London 1954 : 15s. : Pp. 208 : 16 figs.

This is an enthusiastic book and the fact that it is written in the form almost of a series of jottings, or conversations, about unusual aspects of familiar subjects that have struck the author and fired his imagination, helps to communicate some of his enthusiasm to the reader. Like all enthusiasts he tends to exaggerate, and many of his "discoveries" were not so new after all but surely reflected a somewhat deficient or at least one-sided knowledge of the published literature, as in his statement about maize, to the effect that "before I began my work little or nothing had ever been said about races of maize. Corn was supposed to be sharply and uniformly divided into flints, sweets, pops, and the like, with little or no geographical differentiation." However, his points of view on many problems are sufficiently original to make the book worth reading by a specialist as well as the general reader. His main thesis is that the history of weeds is the history of man and that

the two most important groups of plants, constituting the crop plants and their weeds, are the two about which our knowledge is most defective. In one of the early chapters he describes how a careful study of *Tradescantia virginiana* in the wild quickly led him to realize that the cultivated plants known by that name in European gardens are nothing of the sort but are a series of hybrids built up, apparently without conscious selection, during the three hundred years since their introduction, from interspecific crossing between three species, *T. virginiana*, *T. pilosa* and *T. ohiensis*. Hybridization, then, is clearly an important factor in evolution.

The role of polyploidy is illustrated by reference to *Primula kewensis*, the loganberry and other familiar examples, and by the work of McFadden and Sears on the cultivated wheats, where much is made of the participation of what are referred to as humble weeds such as *Agropyron*, *Aegilops* and *Haynaldia*. An analogous case is made out for sugar cane, bananas and cotton, where the evidence of Hutchinson is cited and attention is drawn to the paradoxical situation that we now await the evidence from other cultivated plants such as beans and squashes in order to be able to decide for the anthropologists how much contact there was in prehistoric times between the Old and the New Worlds.

A graphic and picturesque account is given of Vavilov and his theories. Those of us who remember Vavilov will probably be more amused than convinced by the attempt at a phonetic rendering of his English accent but none the less inclined to agree with the author's assessment of his "centres of origin" as being in some cases centres of survival, in others centres of hybridization at points where two or more different floras mingle, either naturally or artificially. In a careful study of many species by what he terms pictorialized scatter diagrams the author and his collaborators have pointed to the occurrence of hybridity in many familiar plants such as sunflowers, amaranths, avocados and pigeon peas, as well as more familiar examples such as wheat, maize and narcissi in which the hybridity awaited no demonstration. In this way he concludes that the Mexican avocados have an admixture of genes from Guatemalan forms; the Mexican sweet corns, and even those of the N. American Indians, have an admixture of South American genes, from which it is deduced, notwithstanding the assertion of some maize experts to the contrary, that sweet corn originated in South America; *Hevea* rubber in the jungle of Brazil shows clear signs of hybrid swarms having developed as a result of alien trees having been introduced into certain villages as nut producers; and *Helianthus annuus* in eastern Kansas shows clear signs of hybridization with *H. petiolaris*, *H. cucumerifolius* and *H. argophyllus*, while in California it has crossed with *H. exilis*. All this crossing is thought to have taken place since the advent of man.

In considering the original development of cultivated plants as a whole much credit devolves upon the achievements of primitive man, who discovered and developed all the major drug plants as well as crop plants in the ordinarily accepted sense. "In the five thousand years of recorded history" we are told "man has not added a single major crop to his list of domesticates." Even the modern Indian is found not to be as inefficient as he is commonly supposed to be and after a survey of a Guatemalan garden the author believes that "if one were to make a careful time study of such an American Indian garden, one would find it more productive than ours in terms of pounds of vegetables and fruit per man-hour per square foot of ground." Not only that, but this type of garden, which looks more like a rubbish heap to superficial observation, provided, it is thought, just that set of conditions which made the origin of many cultivated plants possible: an ecological niche in which a number of different plants would survive, and even hybridize, and a certain amount of selection, conscious or otherwise, of favourable new forms. The Indian corn fields he found had been more rigidly selected for type than those of their Spanish-speaking neighbours, and the greater variability of the crops grown by primitive peoples, it is pointed out, applies only to those most often seen by travellers, namely those in the vicinity of towns and highways, whose ancient cultures have broken down by contact with modern man. The old-fashioned Indians and cottagers who have so far escaped this influence are an inexhaustible fund of information on the intimate relationships which exist between the more primitive peoples and their plants. A project is now under way for making a detailed study of a number of such cottagers, their families and their gardens in Honduras, involving a complete record of all their back-yard plants, ornamentals, vegetables, fruits and weeds, and for each a study of its relation to the family, why it is there, what they do with it, and how it fits into their lives. An investigation of this kind will almost undoubtedly throw new light on many aspects concerning the plants

in question, not least upon their probable mode of origin, and possibly equally interesting light on man himself. We wish the author success in the enterprise.

WEATHERWAX, P.
Indian corn in Old America.
The Macmillan Company, New York 1954 : $7.50 : Pp. ix + 253 : 75 figs. : plates.

"The Indian," it has been said, "does not raise corn to live, he lives to raise corn." This statement sums up the intimate relationship between the South American Indian and the maize plant, a relationship which has provided the author of this most engaging of books with a theme of equal fascination for those interested in man as for those interested in plants. No aspect of the complex interrelationship is omitted; the names of the plant and the references to it in the early chronicles are commented upon with a degree of erudition unusual, to say the least of it, in works on applied science. The author himself makes occasional suggestions concerning the correct interpretation of some of the records, as for instance in the hint that the early Spanish visitors may have mistaken the identity of some of the elaborate *metlatles* or corn grinders and committed a social blunder by sitting on them as chairs! The introduction of maize into the Old World is traced; its cultivation and the multifarious uses it is put to by the American Indian are graphically described and an attempt is made to solve the riddle of its origin. In this connexion the evidence for a nonamerican origin is examined carefully but we are told that "at present we are not aware of a single plant fragment, artifact, illustration, written record, or other concrete evidence of the plant in Asia earlier than about seventy-five years after it could have been taken to eastern India from Brazil"; thus the author strongly leans towards the assumption of an American origin, for which he then proceeds to sift the evidence, starting with legendary material, most of which is aptly designated as being analogous, as regards accuracy and reliability, to Charles Lamb's famous dissertation on roast pig. Next comes the study of teosinte, once regarded as wild maize or its ancestor, and of pod corn; then the archeological evidence, which on the whole is regarded as disappointing, in spite of the fact that grains from tombs perhaps a thousand years old, in the desert coastal area of Peru, will still give a starch test, and some popcorn from the same area has retained the original structure so well that it will still pop, and that recent excavations of maize in New Mexico have been shown by the use of the radioactive carbon test to date back some 4500 years. Doubt is cast on much of the geological evidence and one cherished specimen of "petrified corn" glorified with the name *Zea antigua* has suffered a fate comparable with that of the Piltdown man, having been shown to be an artefact, designed as a children's toy rattle. Others have turned out to be lepidodendrids or members of some other group long extinct. A botanical examination of the various types of maize and the related genera leads the author to regard pod corn as a derivative rather than an original, primitive type; it is even suggested that it may have arisen several times as a mutant in the same way as teopod and corn grass; and scepticism is expressed concerning the theory of Mangelsdorf and Reeves in which pod corn figures as the ancestor of modern maize, the theory being described as "top-heavy with assumptions of such character that if any one of them should be rejected the whole structure would fall." The various objections to the theory advanced include the extreme difficulty of crossing maize and *Tripsacum* and doubt is thus expressed concerning the possibility that teosinte could have been produced in this way at all. Dr. Weatherwax prefers to think of the three genera *Zea, Euchlaena* and *Tripsacum* as having arisen independently by divergent evolution from a common ancestor, which is envisaged as "a plant with the habit of teosinte or some of the tropical species of tripsacum, with bushy, branched inflorescences terminating the main stem and the branches. Each inflorescence had pairs of staminate spikelets on the terminal portions of the branches and pairs of pistillate spikelets on the basal part of each branch. The staminate spikelet was two-flowered, but the pistillate one had only one flower and a rudiment of another. The lower glume of the pistillate spikelet and the adjacent segment of the flower axis had probably not yet developed to the point where they formed a hard shell around the grain as they do in modern tripsacum and teosinte." The Mexican plateau or the highlands of Guatemala are regarded as the locality where the domestication of maize first took place, this being the area where the Aztec and Maya civilizations arose and where tripsacum and teosinte still occur together. The later evolution of the astonishing diversity of the maize plant was made possible by the genius of the Indian grower; the main directions in which variation

from the basic type has occurred are outlined, the author being at pains to give a clear picture of this basic type, the morphological interpretation of which has given rise to a certain amount of controversy among botanists in the past. The part played by the Indian is aptly expressed by the following statement: "Maize is still in the process of mutation, but, as far as new characteristics worth preserving are concerned, the total number that we have found in four hundred years of work with the plant is negligible in comparison with what the Indian had accumulated before that. With few exceptions we have, of course, far better varieties than the Indian ever dreamed of when he was doing things in his own way, but we have secured them almost wholly by sorting out and rearranging the best qualities of the varieties that the Indian had when we first met him." The achievements of modern corn breeding are outlined in three-quarters of a page!

This is a most readable book. It is copiously illustrated with photographic plates, some of them in colour, it is well printed and fully documented, and it gives the reviewer particular pleasure to comment on the many Spanish citations, which are given with a degree of accuracy altogether uncommon in works of this kind.

Bergal, P. & Horne, F. R.
Barley varieties.
Barley Committee of the European Brewery Convention : Pp. E133; D133; F129 : figs. : tables : plates.

The interchange of barley stocks between different countries makes it desirable to have an authoritative description of each of the most important varieties. The Barley Committee of the European Brewery Convention accordingly asked the authors to prepare such descriptions. Samples grown at the National Institute of Agricultural Botany, Cambridge, England, during 1951–52 formed the basis of the descriptions now given in this catalogue. Barleys from Austria, Belgium, Denmark, Republic of Ireland, Finland, France, Germany, Great Britain, Netherlands, Norway, Sweden and Switzerland are described, information on origin, ear, grain and field characteristics, agricultural use and grain composition and quality being provided in each case. A photograph of the ear is also given for each variety. The list appears in a convenient loose-leaved ring-book form and the descriptive notes are given in English, French and German.

Hofsten, C. G. von
Studier över släktet *Taraxacum* Wigg. med särskild hänsyn till gruppen *Vulgaria* DT i Skandinavien. (**Studies concerning the genus *Taraxacum* Wigg. with special reference to the group *Vulgaria* DT in Scandinavia**).
LTs Förlag, Stockholm 1954 : Pp. 432.

Some 15 years ago the author undertook a thorough study of the dandelion as an essential preliminary to research on its control as a weed. As his investigations proceeded, their range became wider and in his final treatment the genus is discussed from the following aspects: taxonomy and ecology with special reference to apomictic forms; genetics and the formation of new types; floral biology; and seed distribution and germination.

Sections are also included on (*a*) the *Taraxacum* flora with special reference to the district round Ultuna and (*b*) the ecology of weed dandelions, their value as forage in grassland and also their undesirable features.

From his own observations on the origin of apomictic forms of *Taraxacum*, the writer inclines to the opinion that apomicts are not necessarily entirely constant and that new types may arise by mutation, a view supported by the results of his investigations on the effects of treating apomictic plants with X rays.

A 12-page bibliography completes the thesis.

Mango studies.
Florida Mango Forum 1951 : Pp. 156 : figs. : tables.

The Florida Mango Forum was established in 1938 with the purpose of encouraging mango production and research. In this volume, papers and informal talks on the cultivation, marketing and preservation of the fruit, presented to the Forum at meetings during the decade up to 1951, have been compiled, together with a few other items, to form an interesting miscellany on the achievements and problems of the industry in southern Florida. Four talks deal with the history of the mango in the state. W. Popenoe comments upon mango production in tropical American countries. T. W. Young gives a report of investigations on unfruitfulness in the Haden mango. A number of contributions provide information on varieties: A list of mango varieties introduced by the US Department of Agriculture, 1899–1937; A study of the identification of mango varieties in Florida, by T. T. Sturrock; Variety descriptions; The influence of the Indian and Philippine mangos on the development of the mango in

Florida, by D. Sturrock; and Mango varieties originating in Florida, by S. J. Lynch and W. J. Krome. Several articles deal with fertilizer practices, mulching, pruning, pest control and other aspects of cultivation. Contributions on processing and utilization include three giving tempting recipes. R. W. Harkness in Laboratory tests of mango maturity and also in a joint contribution with M. Cobin, entitled Haden mango maturity observation during 1950, draws attention to the usefulness of the specific gravity test as an index of maturity. D. T. Simmons discusses marketing problems. Two papers on propagation complete a useful source of information concerning an industry still in its early stages.

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